SCIENTIFIC AMERICAN

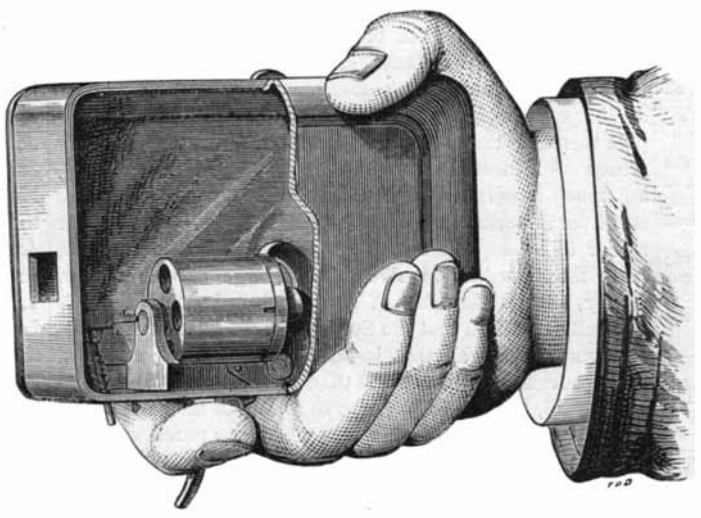
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXXVII.—No. 26. [NEW SERIES.] NEW YORK, DECEMBER 29, 1877. [$3.20 per Annum. [POSTAGE PREPAID.]

A CURIOUS POCKETBOOK.

We illustrate an ingenious combination in which the frame of a pocketbook, a cigar case, and a revolver are united. The advantage of such a pocket article will be readily perceived, as it forms a convenient mode of carrying a revolver for protection, especially when attacked, as it can be fired at a highwayman when handing the pocketbook. The revolver is arranged at the interior, and is attached to the frame, being separated by a metallic partition from the folding pocketbook, which does not appear in the illustration, being on the other side. The trigger is made to swing downward for firing, and can be bent upward into a groove, secured by a catch when not in use. The opening in the side of the frame, shown in the engraving, is closed by a hinged cap, which is opened and shut by the action of the trigger.

Patented November 6, 1877, through the Scientific American Patent Agency, by Oscar Frankman, of Nuremberg, Germany.



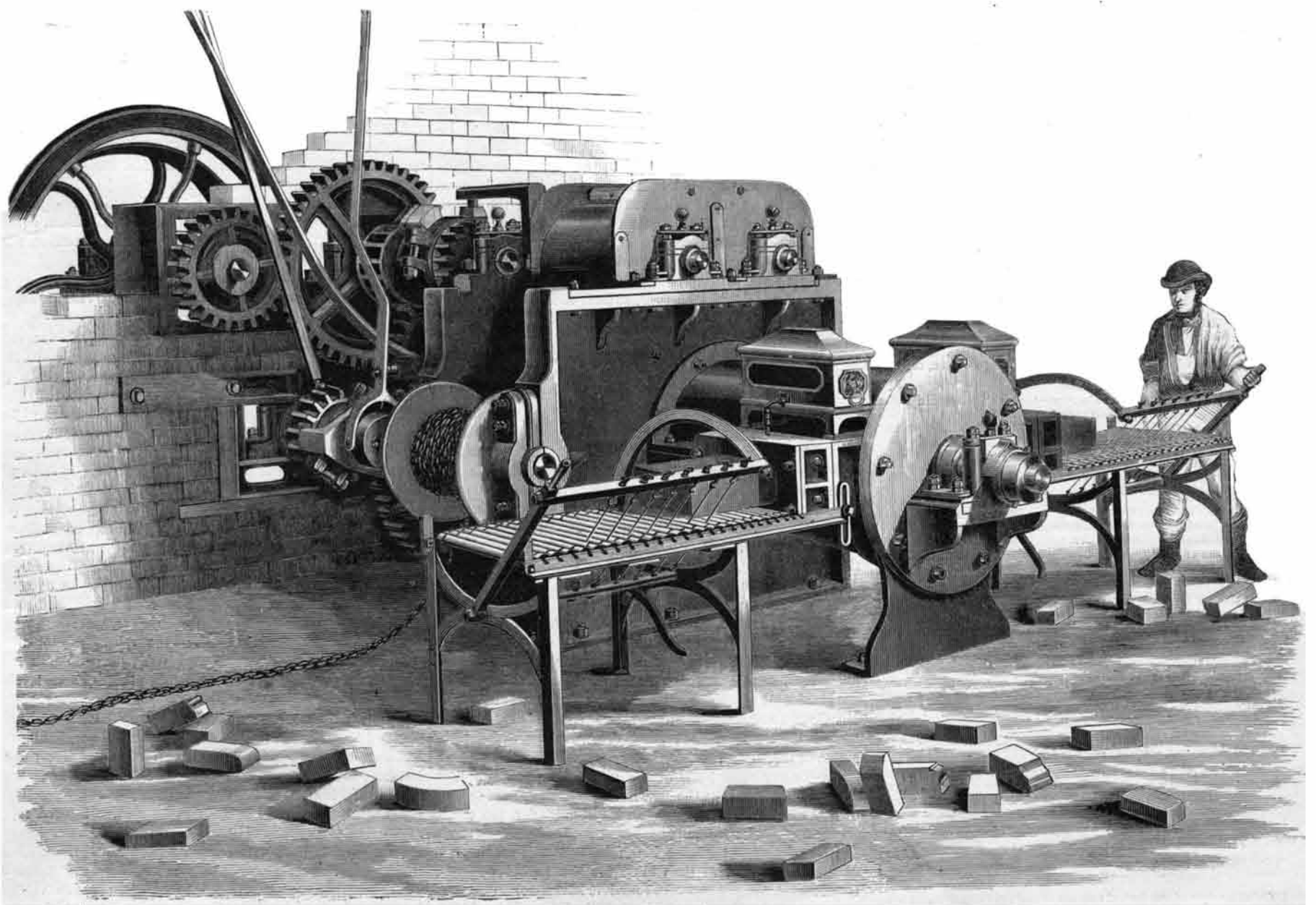
A CURIOUS POCKETBOOK.

BRICK-MAKING MACHINE.

There are several distinct classes of machines in brick-making, which are respectively indicated by the character given to the clay before arriving at the stage of finished bricks. There are the dry and pulverized, the semi-dry, and the wet or plastic machines, each of which claims to have special advantages. Probably, however, the medium condition of the clay will give the most satisfaction in the after burning, and to secure this is the object of the machine of which we copy the illustration and description from *Iron*.

The clay is filled into wagons and hauled to the machine by a winding drum of the machine itself. The power (about 14 horse) is communicated from the engine flywheel to the pulley, of considerable diameter, upon the small first shaft is a strong cast iron pinion gearing into a cogwheel upon a second countershaft, which is carried at one end by a plummer block and wall box in the wall, and a bearing on the other end in the main frame of the machine. Upon this countershaft is a friction clutch, which connects another pinion to this shaft, and from this pinion the two crushing rollers are driven. This second countershaft also drives, by countershaft seen in the extreme left of the illustration. This countershaft will run as fast as 120 revolutions per minute, and is fitted with a small flywheel to steady its motion. The shaft is carried by one outside plummer block, and a plummer block and wall box in the wall. On the end of this a very massive flanged pinion, a large pitched and heavy cogwheel upon the pug shaft, which is a forging of Bessemer steel, and runs through the machine, pugging and working down the clay to the die chamber at the right. The clay is here forced from the two sets of dies on either side of the die box, where the continuous rectangular blocks are received upon roller tables. Across these tables the cutting knives, in a frame, oscillate on a hinge below, and are worked by hand in the usual way. Upon the die boxes are situated two lubricating closets containing water, whence a constant stream is conducted to the dies through small tubes.

The interior faces of the dies are composed of best hard gun metal plates, overlying one another. Sheets of felt at the back absorb the flowing lubricant, and by transferring it to the passing clay between the orifices of the plates keep the sliding surfaces perfectly smooth. A special mixture of metal, harder than steel, is used for the rollers. The hauling drum shaft is carried at one end in a plummer block fixed in the wall, and at the other in a bearing and strong cap against the side of the main framing. This drum shaft is driven by a pinion from the large cog wheel on the pug shaft, and is connected to the drum by a dog clutch or carrier. The pinion drives the carrier through a friction band. The hauling drum has the carrier clutch movable, sliding on a feather key, and fitted with a long shifting lever, projecting upwards to the loading platform. The hauling drum can thus be readily thrown in and out of gear, and at the same time a strap brake is fitted to the drum shaft with a long upright lever, to give command of the load or trucks in running back.



BRICK-MAKING MACHINE.

It is stated that 9,000 feet per minute, measured on the rim, is a safe rule for speeding circular saws.

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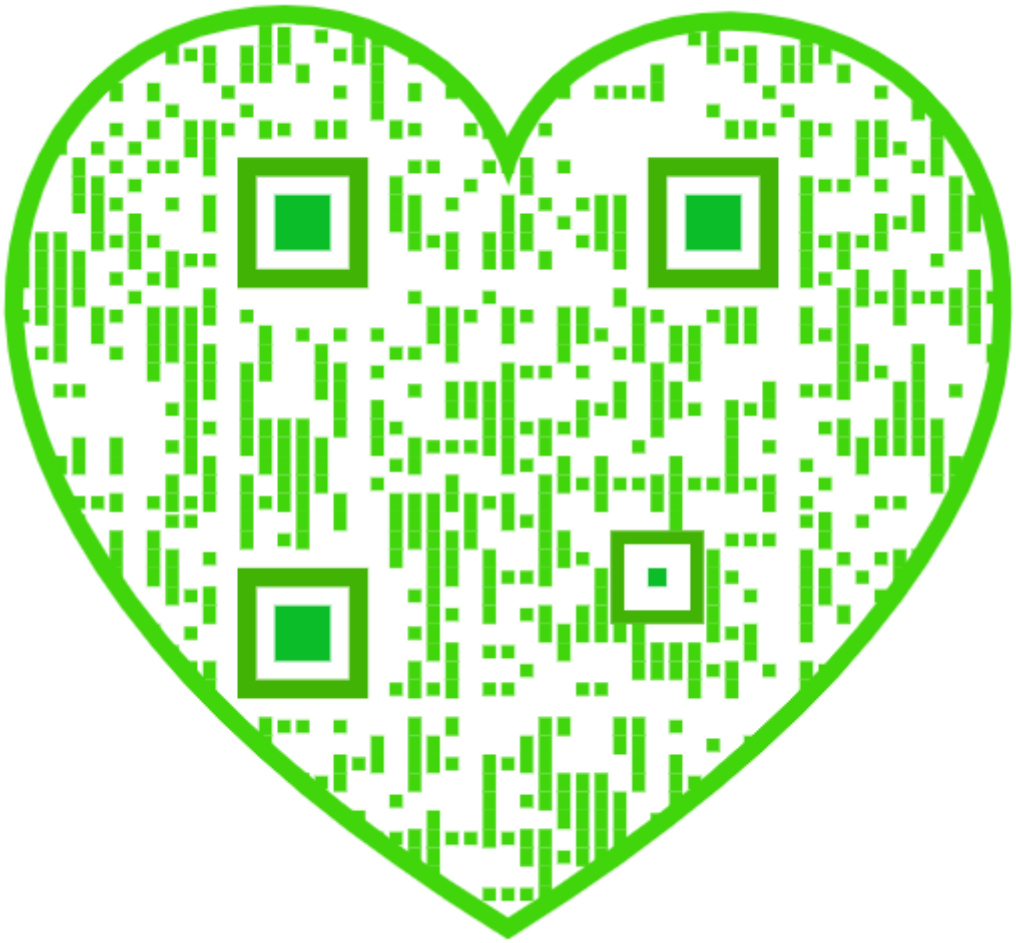

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VOL. XXXVII., No. 26. [NEW SERIES.] *Thirty-second Year.*

NEW YORK, SATURDAY, DECEMBER 29, 1877.

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SCIENTIFIC TRAVELING EXPEDITIONS.

The Woodruff Scientific Expedition, which some months ago was reported to be actively fitting out with a view to departure in October last, has, as our readers are doubtless aware, been postponed, and will not start until some time next spring. Among other claims which the projectors of this scheme put forward was one to the effect that this plan originated with them, and therefore was something quite unique and unexampled in its way. This statement cannot be fully substantiated, inasmuch as the Woodruff scheme is not by any means the only one of its kind. In fact there were like plans projected probably before it was thought of, and there are various others now in existence. As in a round-the-world voyage it matters very little where one starts from, the fact that the other expeditions are to sail from Europe will not militate against their benefits to intending participants on this side of the water. Hence we give a brief summary of the objects and purposes of each of these schemes, in order that our readers, in the interval which must now elapse prior to the departure of the Woodruff vessel, may have an opportunity of making comparisons and a judicious selection of the particular scientific expedition which they will patronize. We use the adjective "scientific," not because the projectors of the schemes other than Woodruff's lay claim to it, as does that gentleman, but rather because it is fully as applicable to their plans as to his.

In England, there are now three expeditions under way, namely, that of Messrs. Cook & Sons, of Gaze and Sons, and of Grindlay & Co. In France there are two, that of La Société des Voyages (joint stock concern), Paris, and that of Captain Radou. In Germany there is one, that of Herr Karl Stangen, of Berlin. In order to consider these scientific expeditions scientifically, they may be classified first with those which do not possess private means of locomotion, but propose to travel by existing means of intercommunication, and second, into those which will possess separate vessels, to be at the disposition of passengers during the entire voyage. Of the six above mentioned, three, Cook's, Gaze's, and Stangen's, schemes belong to the first, and the rest to the second class.

I. Cook's Scientific Expedition.—The firm of Thomas Cook & Sons is so well known as tourists' agents that it is here deemed quite useless to explain their general mode of operations. In fact circulars, etc., in voluminous quantities are obtainable at the office of the concern in this city. To Mr. Cook a round-the-world voyage is a mere bagatelle, and he sells tickets which are good for traveling expenses in Maine or Hindostan, and for hotel charges in Alaska or Australia—or any other parts of the globe the purchaser may desire to visit—so that the traveler has only to make out his own itinerary, and he may pay a sum in gross for the entire trip and go alone: or he may join an expedition, pay so much for the privilege, and have his goings out and comings in regulated per Cook's time table for the period enjoyed. Cook's sixth round-the-world tour left Liverpool on August 25th last, and will return on March 25th, 1878. Price $1475. Route same as that of Mr. Phineas Fogg in Jules Verne's "Round the World in 80 days," which see for further particulars. It will be observed, however, that in this scientific expedition out of six months 3½ are spent at sea and 2½ utilized in excursions in the United States and Asia.

2. Gaze's Scientific Expedition is organized on the same plan, but is not to furnish a conductor who travels with the party. Tickets alone are issued good on railroads and steamers over a given route.

3. Stangen's Scientific Expedition.—Stangen used to conduct expeditions for Cook, and knows the business. Participants (we quote from the prospectus) are expected "to belong, without exception, to the best society." The voyage is to last eight months, and the expedition is to depart in May, 1878. Price $2,930, including a "banquet at the Kaiserhof Hotel, Berlin, of all the members who have taken part in the expedition," when they get back. The route is about the same as that of Cook, that is, across the Atlantic, across the continent, across the Pacific, and then a general skirting of Asia, a journey through the Suez Canal, across the Mediterranean, and so home. Mr. Stangen proposes that he shall have absolute power "to do whatever is necessary for the amusement and instruction of the voyagers." In this respect he surpasses Woodruff. Next we come to Grindlay's plan.

4. Grindlay's Scientific Expedition.—Grindlay intended to depart last April, but analogously to Woodruff he put it to August, and then didn't go. But like Woodruff, he has not renounced the scheme. He has the steamer Sumatra; duration of voyage, nine months; route, coasting along the Mediterranean, through Suez Canal, around Asia, cross over the Pacific to San Francisco, down along the coast of South America, around the Horn, up along the coast again of both continents, and then across the Atlantic. Price $2,500. Travelers pay their own expenses when ashore. *La Nature*, from which we are taking this information, naively presents three reasons why Grindlay's ship did not sail. First, the Russo-Turkish war; second, because Grindlay wanted fifty subscribers and could not get them; and, third, because five months of the time is spent at sea. The relation of the first is obscure; the rest are amply sufficient.

5. Radou's Scientific Expedition.—Captain Radou wants to take young people around the world and complete their education, for the small sum of $1,200 each. When it is considered that the vessel is to be propelled only by sails, and is to occupy fifteen months in traversing the shores of North America and British India, besides doubling the Capes of Good Hope and Horn, this sum seems quite moderate. The difficulty with M. Radou's plan is that he thinks sixty travelers can be stowed away comfortably in an 800 ton vessel, which he proposes to buy for $18,000. He has not gone yet, and fails to state exactly when he proposes so to do.

6. The Society-of-Voyages-of-Study-Around-the-World's-Scientific Expedition.—This concern has the advantage of having successfully managed one expedition, and it seems to be the most practical and sensibly organized of all. Its subscription is limited to 66 passengers, but if 30 join the ship sails. Some very influential people in France are giving the plan their support. The price varies according to accommodations. The average charge is $3,400, but this includes all the expenses of extensive shore expeditions, so that the traveler's actual outlay for the trip proper is not more than $800. The vessel is a fine fast steamer, and her route lies to the eastward. It embraces the journey through the Mediterranean, the Indian Ocean, Malayan Archipelago, across the Pacific, along both shores of the American continents, and finally across the Atlantic. This expedition will start on June 1, 1878.

THE AMERICAN MACHINERY AND INVENTIONS, WANTED ABROAD.

The State Department is rendering very valuable service to the country by requiring our consuls to report as to the condition of trade at their respective posts, as well as to make suggestions as to the best means of increasing our foreign commerce. Some of these reports bear the mark of being the result of thorough and systematic researches, giving valuable lists of goods that are likely to find a sale, and hints as to the means of developing trade. The system, although in its infancy, has proved very valuable, and our manufacturers are already reaping the advantage of it. We give below a condensation of several of the reports lately received, in hopes that our readers may profit by them and thus, by developing a foreign market for their wares, hasten the approach of the "good time" that seems so long in coming.

The Consul-general at Berlin in one of his reports gives three lists of American manufactures, as follows:

Articles that find ready sale: Fine castings, bronze or maroon-colored; breast drills and wrenches; circular and butcher's saws; try squares, trowels, plumbs, and levels; augers and auger bits; mouse and rat traps: door bolts; cast iron stable fittings; shovels; hickory handles: chisel, file, and auger handles; oilstones and grindstones; padlocks; box scrapers; can openers; gas tongs; mincing knives; shoe brushes; leather; boots and shoes; pressed glassware. Our agricultural implements have long been favorably received, but recently imports of inferior articles have injured their reputation. The following articles are steadily gaining on the market: Hickory wheels, spokes, and wheel rims; windmills; ventilators; steam pumps; gas fittings; portable steam engines; woodworking machinery; cheap clocks; housekeeping and kitchen utensils, especially novelties.

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Articles that can be made salable with proper effort: Wood planes, by altering the shapes; wrought iron hinges, by lowering their price; scythes, by conforming to the required shape; machines for making tacks and nails; cheap furniture.

Unsalable articles: Hand, back and panel saws, too high priced to compete with the French, who control the market; draw knives, chisels, gauges, and plane irons, too dear to compete with the English; cooper's tools—not the required shapes; cast iron hinges; harness and horse brushes, too dear; curry combs, too light; sewing machines.

In connection with the last article on the above list, the Consul-general at Vienna makes a novel suggestion as to our patent system to the effect that our laws should be so changed as to allow any citizen the privilege of manufacturing patented articles for exportation to any country where they are not protected, so as to be able to enter freely into competition with foreigners in their own open markets. The consul argues that as under our present system the inventor having the monopoly of a vast home trade is careless of foreign markets and does not care to relinquish any of his large profits to encourage a foreign trade, his product is imitated abroad and sold at a less price, and a trade thus built up which our home manufacturers find it very difficult to compete with after the patent has expired. This has proved to be the case with the sewing machine, the manufacture of which is now so thoroughly developed in many of the German and Austrian cities that the American manufacturers cannot compete with them successfully.

The Consul at Chemnitz, in Saxony, states that, owing to the fact that the majority of the inhabitants of his district are primitive manufacturing peasants, the prospect of doing much trade with them is not very good, yet he thinks there are many American articles that could be sold there, if proper steps were taken to introduce them. Among these may be cited wooden ware, mechanical tools, spun cotton, muslins, calicoes, baking powder, dried and canned fruits, lard, cured meats, butter (at certain seasons), agricultural implements, carriages, harness, and stoves. To introduce these the Consul thinks that merchants and manufacturers, by combining to establish a general depot at Hamburg or Bremen, and employ skilled travelling agents, might build up considerable trade in time.

Our Consul at Cologne advocates a similar style of proceeding to develop trade, and suggests Berlin, Cologne, and Frankfort as the proper places to establish manufacturers' agencies, inasmuch as Berlin controls the trade of northern Germany, Cologne that of the Rhine and central Germany, and Frankfort that of the south. It is suggested, however, by the Consul at Leipsic, that as the great spring and fall fairs of that city attract buyers from all parts of Saxony and central Germany, a sample depot of American goods, especially at the spring fair, in charge of a skillful salesman, would do more to open a market for the manufactures of the United States than weeks or months of the scattered efforts of travelling agents. The same gentleman states that a great interest has sprung up in his district since the Centennial Exhibition brought our products to the notice of intelligent German visitors, notwithstanding that the people generally are slow to accept innovations on established usages and are distrustful of foreign importations, yet the little knowledge they have of our manufactures has created considerable inquiry and demand on the part of consumers which the dealers must satisfy. As instances, it is stated that the hardware dealers are compelled to keep many American tools in stock, as they are considered the best; stationers sell our gold pens and knicknacks; shirt makers have to keep American shirting cottons; our silver ware has a high reputation, and one dealer has just successfully introduced our paper hangings.

Denmark being, says our Consul at Copenhagen, a large exporter of agricultural produce, affords a poor market for this class of goods from the United States, with the exception of corn and meal, butter and cheese. The mineral products of Denmark are limited, so that iron and steel and most manufactures thereof have to be imported. All her coal comes from England, and as the prices of coal in England and the United States are about equal, the experiment of supplying the Danish market with American coal could be tested. American butter, although not so good as the Danish, is beginning to rival it; and the Consul thinks that if our dairymen understood the preparation and packing of butter for export as well as the Danish, they would not only command the Danish market, but that of most other countries as well; he therefore suggests that some intelligent American dairyman should visit Denmark to acquaint himself with the Danish practice. American cheese is well liked in Denmark, and its trade could be greatly increased. The same is true in regard to our agricultural machines, sewing and knitting machines, mechanic's tools and implements, leather, cotton, and linen manufactures, leaf tobacco, sugars, molasses, etc. Direct steam communication is recommended as one of the many things necessary to establish this trade.

The Consul at Bristol, England, also advocates the combining of merchants and manufacturers to establish agencies for the sale of such articles of American manufacture or growth as through their superiority or cheapness will be likely to find a market there. He mentions that the main articles of export from the United States to that port are beef, butter, bacon, cheese, canned meats and fruits, flour, grain, oil cakes, oils, sugar, tallow, clocks, melodeons, wooden ware, leather, and some little machinery.

From Leeds, the Department has received a lengthy report which, besides giving statistics of the harvest, importation of wheat, etc., has some additional information relating to our manufactures, from which it appears that the importation of American watches has assumed respectable proportions, with good promise of further development, as they are looked upon as superior to the Swiss, but very little dearer, as equal to the English and very much cheaper—a happy medium, which enables them to sell rapidly. The Consul says he feels assured that a good trade in American shoes could be established in England, if our manufacturers would study the especial requirements of the market, sending nothing but just what the English taste demands. He also thinks that when our wine makers learn how to properly prepare their wines so that they will assume a fixed and stable character, England will purchase largely from us; and suggests that as the English sell vast quantities of what is known as "British spirits," made from our corn, to the wine makers on the continent of Europe for giving additional strength to their wines, that our distillers should manufacture this article and export it direct to the wine producers.

From Japan our Minister writes that there is a fine chance for our manufacturers of cotton goods, as well as woolen cloths and yarns, to introduce their wares. The present market is largely controlled by English houses, but the quality of their goods is inferior to American fabrics, though the prices are the same or higher.

Similar reports come from our Consul at Demarara as to our cotton goods in British Guiana, where it appears that our manufactures are somewhat known, but strange to say, writes the Consul, all the American favorite brands reach the colony through England. Our willow ware, cutlery, tools, leather, boots and shoes, etc., are thoroughly appreciated and command ready sales; but it is thought a much larger trade could be had if we had direct communication by steam, instead of sending the goods through English houses.

From Central America our Minister states that our productions are of a kind that are much sought after there, but that our merchants and manufacturers do not seem to make the same exertions to control trade as do their European rivals. Their price lists are incomplete, their commercial representation imperfectly conducted, their packing more expensive and yet inferior. The German merchants take advantage of this and successfully rival us in the trade of that region, controlling the trade of Central America. They appear to conduct their business more systematically, and their representation is much more efficient from their prevalent custom of sending out young clerks to be educated to the business until they become resident partners.

From Buenos Ayres, the Consul reports that loud calls are being made for the abolition of the discriminating tariff against the United States, which was fixed by a commission of which one of the members was a British merchant in active trade who managed to value American manufactures so high as to make it impossible for them to compete with those of Great Britain. The superiority of our cotton fabrics is fully recognized in the Argentine Republic, and this is the plea for their high valuation. As a result of this the British manufacturers counterfeit by wholesale the brands of favorite American goods, but get them in under the low valuation as British goods, and then sell them in the north as American, so that from the comparatively low price at which these counterfeit American goods are sold, the genuine articles have no chance of being sold.

CUCA AS A STRENGTH SUSTAINER.

In many callings it is occasionally necessary for a man to put forth extra exertion for protracted periods of time; as, for example, a sailor during a storm, a soldier on a forced march, an engineer in case of accident or impending disaster. Frequently, at such times, it is impossible to procure or to prepare suitable food for the increased demands of the system, or to obtain the sleep which both body and mind require. Yet it is desirable, perhaps imperative, that both body and mind shall be kept up to their best working capacity. In every part of the world and in all stages of civilization, men have discovered means more or less efficient, more or less harmful, for meeting such emergencies; and one of the hardest lessons of human life and experience has been to learn how to use such aids to endurance without abusing them. Even the most useful and least harmful of them—tea, coffee, wine, tobacco, and the rest—are mischievous if not worse when used habitually or in excess; while others, like the various alcoholic beverages, are apt to disturb what is so essential in critical emergencies, the proper action of the brain. It is natural and proper, therefore, that those who recognize the practical need of the race for what may be called special foods, should take a lively interest in the demonstration of means for securing the good results aimed at by all of them, with the least possible physical and mental risk. The latest claimant for this responsible position is the leaf so long used by the mountaineers of South America—*cuca*; and perhaps the most instructive test of its virtues thus far made is to be credited to the Toronto Lacrosse Club, a company of intelligent gentlemen, most of them occupying high social and professional positions, and all of sedentary occupation. The latter point is important, since men of indoor life are not the most favorable subjects for occasionally putting forth violent and protracted physical effort; while the matter of intelligence is not less important in determining the value of their estimate of the aid received by the use of cuca.

In the spring of 1876 several of the members of the club began to use cuca as a strength-sustainer, with results so satisfactory that nearly all the "first twelve" used the leaves during all their important matches. There were ten in number, and some of them lasted for several hours. The club, it will be remembered, held the championship of the world and maintained it throughout against all comers, Indians as well as whites.

Their practice was to serve out to each man at the beginning of a match about a drachm or a drachm and a half of the cuca leaves, to be chewed in small portions during the progress of the game, the saliva to be swallowed. The effect, the experimenters report, was a sensible increase in muscular force and an almost entire exemption from fatigue. The pulse was increased in frequency, and perspiration was augmented; but no mental effect was observed beyond the natural exhilaration of contest and vigorous exercise. There were no subsequent disagreeable effects; and no alkaline matter was used with the leaves, as is the practice in Peru.

On one occasion, in midsummer, the thermometer marking 110° in the sun, a match was played with a club of mechanics and other out-door workers, of sturdy build and in fine condition. The cuca chewers came out of the game as elastic and apparently as free from fatigue as when they began, while their opponents were thoroughly exhausted.

The experience of the past season, so far as reported, substantially confirms that of the preceding year. Nearly every member of the club is confident that the cuca has been of great assistance in sustaining strength. Two or three are doubtful; not one finds it injurious. It is proper to add that among the South American natives, by whom cuca is used with lime and to excess, its effect is often disastrous, imbecility being a common result of its protracted use.

Harvard Observatory.

Professor E. P. Pickering, director of the Harvard Observatory, in his report says that the great equatorial telescope has this year been employed mainly in a new and highly important work—that of measuring the relative brightness of various celestial objects. To effect this, new photometric apparatus had to be invented and adapted to the telescope. Among the most interesting results of the work may be mentioned those derived from a long series of measurements of the brightness of the satellites of Mars discovered last summer by Professor Hall, of Washington. From these measurements it may be inferred with considerable confidence that the diameter of the inner satellite is about seven miles, and that of the outer and smaller satellite about six. Accurate photometric measurements have also for the first time been obtained of other very faint objects, as well as of several planets (including asteroids), satellites, and double stars. Besides the photometric observations of the satellites of Mars, their positions were measured with the filar micrometer by Mr. Waldo, who obtained a series of observations of this kind which is believed to be second only to that made by Professor Hall with the 26 inch telescope at Washington.

The meridian circle has been kept in constant employment by Professor Rogers, who has continued his series of observations of the fixed stars between 50° and 55° north of the celestial equator. This work constitutes the share taken by the observatory in the general revision of Argelander's great catalogue of all the stars of the northern hemisphere visible with small telescopes. Besides these observations, Professor Rogers has made others of an extensive list of the brighter fixed stars, and has determined the apparent places of the planet Mars with respect to the stars surrounding it at the time of its recent opposition.

Many geodetical observations were made by Professor Pickering during the summer, chiefly for the purpose of determining the effect of atmospheric refraction upon the measurement of altitudes. These observations were made with instruments of Professor Pickering's invention, which are very portable, while at the same time they promise to yield results of great accuracy.

Singing Mice.

In *Nature* was recently published an account of a singing mouse. A correspondent of the SCIENTIFIC AMERICAN gives us his testimony to a fact which is rare, though as certain as that canaries sing. A few winters since, while one of his family was amusing herself at the piano, a mouse made his appearance on the threshold of the apartment, and, undismayed by the light or the presence of the family, chirped and carolled with intense satisfaction to itself, and to the great delight of its audience. Frequently afterward, but always in the evening, the rare songster repeated his performance. The piano keys were never struck that the mouse did not follow; but when the instrument was not touched, the music from the mouse would come, as if for a reminder. Sometimes the little animal made himself visible and sometimes was hidden in the pantry which, for reasons obvious to housekeepers, he, she, or it had selected as an abode. One evening the mouse was traced to the stairway. Under the carpet sat the little creature, throwing his soul into his song. A lamp was placed beside him, and the family stood and looked and listened for half an hour or more. His head was up, and the movements of the muscles of his throat were plainly visible. Unfortunately our correspondent undertook to capture the singer. Many mice were caught and each was given twenty-four hours grace to sing for its life. But never after the treachery of the trap was the sound of the mouse's carol heard. If caught he died and made no sign.

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30-TON STEAM HAMMER.

At the works of Sir William Armstrong & Co., at Elswick, England, is a thirty-ton steam hammer, which was constructed by the Messrs. Thwaites and Carbutt, of Bradford, England. The hammer has a 30-ton tup with 12 feet stroke, and the steam cylinder is 48 inches in diameter. As will be seen in the engraving (taken from *Engineering*) the frame is of a very simple and massive design, it consisting of two standards of circular section, slightly tapering in diameter and inclined inwards towards the top. These standards, which are each made in two sections, are 25 feet high, and the total height of the hammer, from floor line to top of cylinder cover, is 42 feet 9 inches, a dimension which will give some idea of the enormous size of the structure. The clear span between the standards at the floor line is 19 feet 10 inches.

IMPROVED THIRTY-TON STEAM HAMMER.

STEVENSON'S SUSPENSION RAILWAY.

At a meeting of the British Association, Mr. G. Stevenson read a paper on "Street Locomotives," in which he described the somewhat singular system of constructing railways, of which we copy an illustration from the *Engineer*. The engraving almost explains itself. The rails are supported by strong wrought iron clips suspended from brackets projecting from upright columns fixed on the out edge of the pavements in streets, while the cars are also suspended from the rails by means of steel carrying rods descending from the axles of small traveling wheels. Either horse or steam power can be used, the engine being suspended in the same manner as the cars. Among the advantages claimed for it are that the roadway is not cut up, and that the resistance to draught is materially reduced.

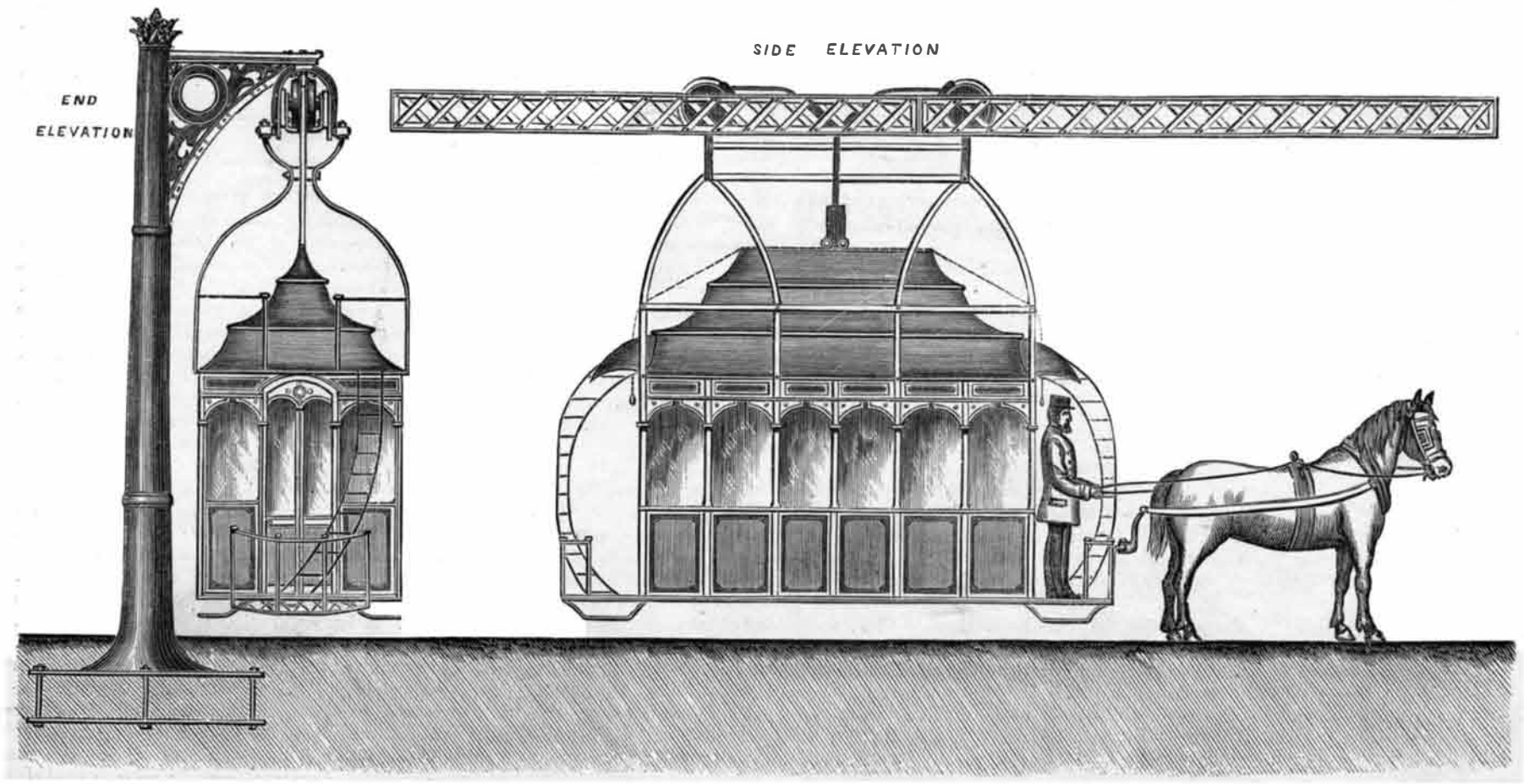
Rhizopods.

Professor Joseph Leidy, the eminent comparative anatomist and microscopist, made his second visit to the West the past season, under the auspices of the Hayden survey. He made a careful exploration of the country about Fort Bridger, the Utah mountains and the Salt Lake basin, in search of rhizopods. He has been engaged for a long time on a memoir on this subject, which will eventually form one of the series of the quartos of the survey.

The rhizopods are the lowest and simplest forms of animals, mostly minute, and requiring high power of the microscope to distinguish their structure. While most of them construct shells of great beauty and variety, their soft part consists of a jelly-like substance. This the animal has the power of extending in threads or finger-like processes, which are used as organs of commotion and prehension, often branching. From the appearance of their temporary organs, resembling roots, the class of animals has received its name of rhizopoda, meaning, literally, root-footed. In compensation of the smallness of these creatures, they make up in numbers, and it is questionable whether any other class of animals exceed them in importance in the economy of nature. Geological evidence shows that they were the starting point of animal life in time, and their agency in rock making has not been exceeded by later and higher forms. With the marine kind, the foraminifera, we have been longest familiar. The beautiful, many-chambered shells of these—for the most part just visible to the naked eye—form a large portion of the ocean mud and the sands of the ocean shore. Shells of foraminifera likewise form the basis of miles of strata of limestone, such as the chalk of England, and the lime stones of which Paris and the pyramids of Egypt are built. Fresh water rhizopods, though not so abundant as marine forms, are, nevertheless, very numerous. They mainly inhabit our lakes, ponds, and standing waters, but they also swarm in sphagnous swamps, and ever live in newest earth. Professor Leidy has devoted several years of study to the fresh water rhizopods of the eastern portion of our country, and his especial object in the past expedition was to investigate those which are to be found in the elevated regions of the Rocky Mountains.—*Mining and Scientific Pre s.*

THE San Francisco mint is the most productive institution of the kind in the world. Its coinage last year amounted to $42,704,500 more than the aggregate production of the three largest mints in Great Britain.

IT takes 80,000 feet of lumber per day to run the Consolidated Virginia and California mines. One half of this goes down the old shaft and one half through the C. & C. shaft. The total requirements are 2,400,000 feet per month.



STEVENSON'S IMPROVED SUSPENSION STREET RAILWAY.

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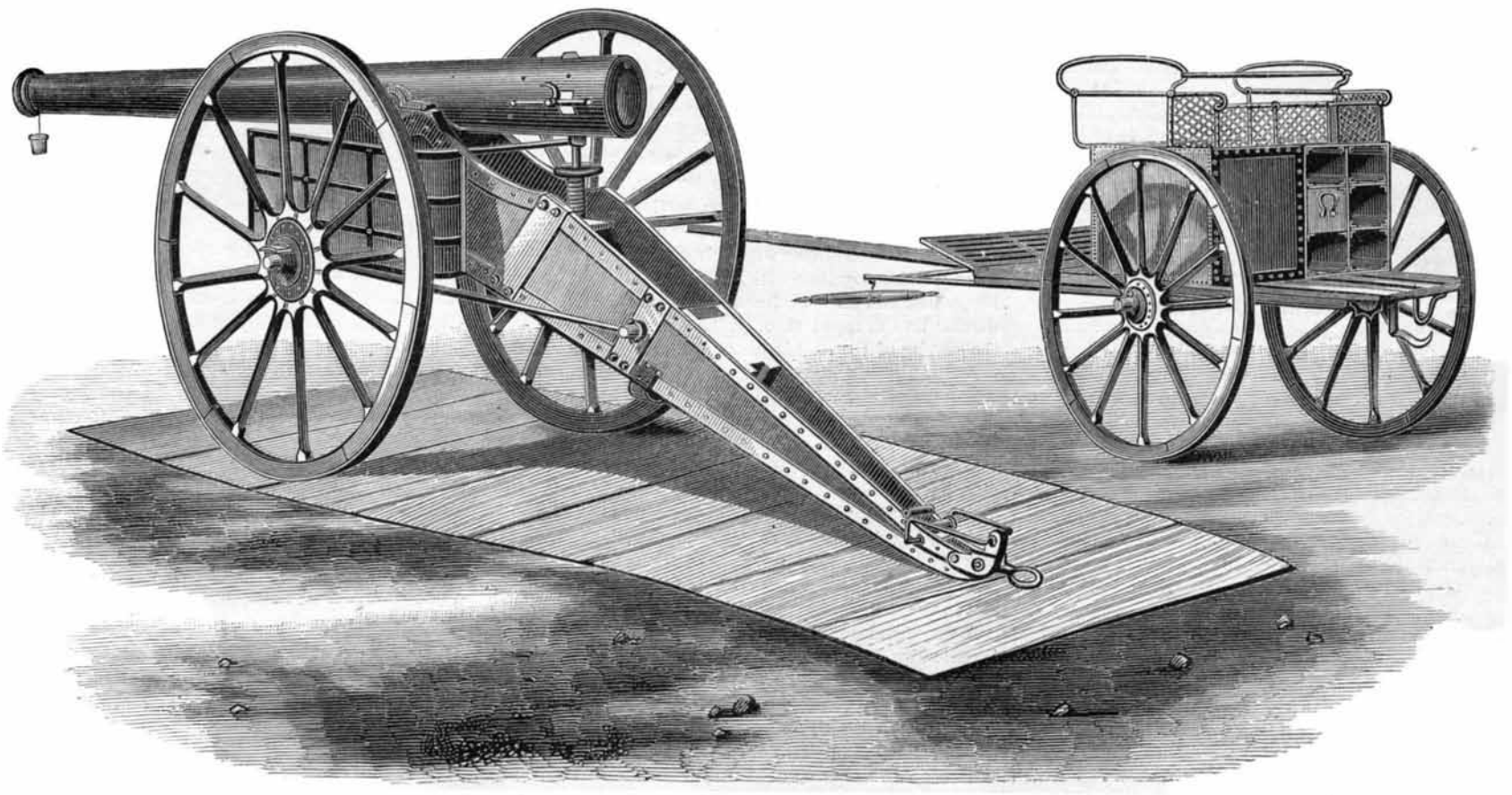
THE UCHATIUS BRONZE STEEL GUN.

The Uchatius bronze steel gun is cast by placing in the center of the cast iron mould a cylinder of copper, which, by absorbing part of the heat of the molten metal, causes rapid chilling of the central portion. Both the interior and exterior portions are thus formed of the same quality of metal. In five minutes the entire mass solidifies. It was, however, found that a deep recess was formed in the top of the casting, as shown in Fig. 1.

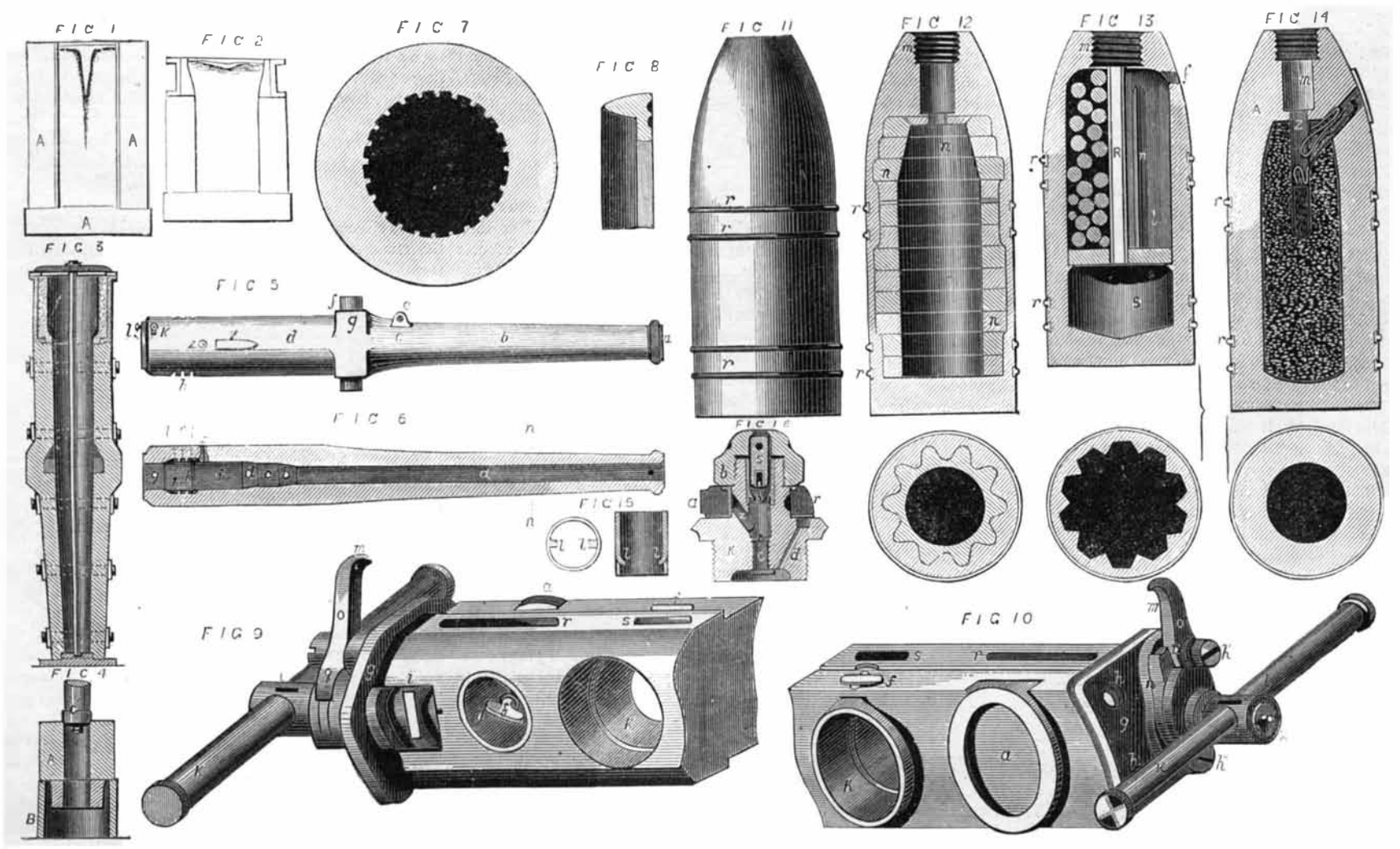


THE UCHATIUS BRONZE STEEL GUN.

General Uchatius met this difficulty by the addition of a sand mould, so as to form a dead head, in which the metal remained in the molten state for a comparatively long time, and so filled up any recess (Fig. 2). In Fig. 3 is shown the mould ready for casting a field gun with the interior copper cylinder. The core is eventually entirely removed by the boring bit. In a gun whose bore is about 3¼ inches, the bronze is compressed by the introduction in succession of six steel mandrils (*c*, Fig. 4), which are forced home by hydraulic pressure. The mandril is formed at the end in a truncated cone, so as to force the metal outwards and enlarge the bore, giving a calibre of 3½ inches. B, Fig. 4, represents an annular support on which the gun rests. Figs. 5 and 6 are the section and external forms of the gun, and the large cut shows both the gun and its limber.

The axis of the trunnions is in the same horizontal plane as that of the piece, and the trunnion arms themselves are hollowed out conically on the face. The piece is vented vertically a little in front of the breech-block slot. The latter is cut laterally near the breech and right through the piece. The gun is sighted at the right side with a small screw sight, screwed into a patch on the gun in front of the trunnions, and a tangent sight, R, at breech end of the piece. Looking at Fig. 6, we see that the bore, shot and powder chambers have different calibres, and that only the bore proper is rifled. A copper bush is screwed into the breech end of the powder chamber, for the reception of a copper Broadwell ring (Fig. 8). The breech block, Figs. 9 and 10, is also of bronze steel, and rectangular. Along the upper and under surfaces run a projection and deep groove, ensuring, together with the ribs, *l*, a perfect fit when the block is home. The loading cylinder, *k*, is dovetailed into the breech block, as shown, so as to be capable of movement forwards and backwards. To the left of the breech block is attached the arrangement for moving it. This consists of the plate, *g*, through which passes the spindle of the square-threaded screw, *i*, in Fig. 9, which carries the cross handle, K, which is itself secured by a catch, *m*. A slight pressure on the long arm, *o*, of the catch releases the nose, *q*, when the handle is free to move until it becomes horizontal, when the spring presses on the second nose, *p*, and secures the handle in a new position. As the thread of the screw is now withdrawn into the block, the latter can be moved outwards, towards the left, and when the loading is completed, the arm, *o*, is again pressed and the movements reversed, and so on.

The projectiles are of four kinds—common shell, shrapnel, carcase, and case. Rotation is given by means of four copper rings pressed into undercut rings around the projectile. The common shell, Figs. 11 and 12, is of the so-called double wall description, which has for its object to give as many splinters as possible of a size sufficient to kill a man. The inner wall is cast so as to consist of twelve horizontal and parallel rings, grooved longitudinally by deep lines of weakness. The fuze hole is separated from the interior by a diaphragm cast into the neck of the fuze hole. The shrapnel, Fig. 13, has the powder charge at the bottom, separated



THE UCHATIUS BRONZE STEEL GUN.

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from the bullets by a thick diaphragm and ignited through a tube passing down the center of the shell from the fuze hole. The carcase, Fig. 14, is cast with very thick single walls, and its original head has three firewalls covered with pitch plaster. The interior is filled with a carcase composition, and a channel down the center, as well as other channels leading to the fuze holes, are filled with mealed powder, with quick-match leaders. The case consists of a zinc cylinder filled with bullets composed of lead and antimony, between which molten sulphur is run. Percussion and time fuzes, Figs. 15 and 16, are used. The gun carriage is made of thin Bessemer steel, strengthened with angle iron. The limbers of light and heavy guns are interchangeable. The heavy gun throws a common shell of 16.1 lb., and at 2,000 yards it has 40 feet more velocity than the 15·4 lb. shell of the Krupp gun. The light guns are, however, inferior to the Krupp guns of the same calibre. Krupp guns also cost three or four times as much. The Austrians are highly satisfied with their guns, which are considered quite equal, and probably a little superior, to the German Krupp steel guns of latest pattern. We are indebted to the *Engineer* for our illustrations.

Communications.

What the Telephone Heard.

To the Editor of the Scientific American:

A prominent drug firm having a store in each end of this city, being two miles apart, have recently established a telephonic connection, and have now in daily use a set of Bell's new telephones, which seem to work admirably. They are so well pleased with the new communicator that the old system of telegraphy heretofore in use has been entirely discarded. But the purpose of this note more especially is to inform you of the singular freak, or wonderful power and capacity of this little telephone, exhibited here a few weeks since. An accurate and experienced Morse sound reader chanced to be in the down-town store of the above firm, and while having the telephone to his ear heard what he thought to be the clicking of an instrument. He took pencil and paper and wrote what he heard, which proved to be a message from the Western Union office there, which was passing over their wires. He went immediately to that office and asked the operator if he had just sent the message which he then read to him from his telephonic notes. The Western Union man replied that he had, and could not possibly conceive how this gentleman had obtained it.

All the explanation that can be given in regard to this is that for a short distance both the telephone wire and those of the Western Union main line are strung on the same poles. Will Professor Bell explain to us this strange conduct of the child of his genius? This may not be the first instance of the kind, but I do not remember to have seen any record of the like before. H. HENDRICKS.

Kingston, N. Y.

A Brilliant Meteor.

To the Editor of the Scientific American:

Noticing the communication of Mr. Robert C. Hindley in your number for December 1, page 342, current volume, with the above caption, I turned to my journal to examine a memorandum made by me of a meteor seen about the same time. The entry in my journal and the account of Mr. Hindley agree so closely in everything except the date—mine being on the 12th, and his being on the 11th of November, that I am persuaded that we saw one and the same phenomenon, and that one or the other of us has mistaken the date. I transcribe my entry, which is as follows: "On leaving Mrs. S.'s this evening, as I came out the front door I was startled by a sudden glare of light, which seemed to come from right in front of me. Throwing up my eyes I saw a large and very brilliant meteor in the northeast, falling apparently near straight downward, with a slight deviation to the east. When I first saw the meteor it was about 30° in height and, judging from the length of time it took to traverse the remainder of its course, it must have already fallen three or four degrees. It fell through an arc of about 12° or 15° in all, and was about ten seconds falling. When I first saw it it had a golden hue, which suddenly changed to green of that peculiar shade produced by burning chlorate of potash with nitrate of barium and sulphur. The light shed by it was pulsating and sufficiently powerful to light up the Tennessee shore and the sand bars, so as to show every log and stump. On looking at my watch, I found that it was 36 minutes past 6 o'clock."

I do not write up my journal every night, and make entries only when something occurs which I wish to record: hence I may have made a mistake as to the date. The peculiar green hue of the meteor struck me as strange, and immediately suggested the green fire produced by pyrotechnists by a mixture of barium nitrate, potassium chlorate, and sulphur. FRANK L. JAMES, Ph.D., M.D.

Osceola, Ark., Nov. 26, 1877.

Blister Beetles: Correction.

To the Editor of the Scientific American:

The explanations to Figs. 1 and 2 in my blister beetle article in your issue for December 1, got transposed. Fig. 1 is that of *Meloe*; Fig. 2, that of *Sitaris*.

C. V. RILEY.

GLAZIERS' PUTTY: Whiting, 70 lbs,; boiled oil, 20 lbs. Mix, and add whiting or oil as needed.

New Inventions.

Mr. John W. Wallace, of New York city, is the inventor of a new Jack Clip or Thill Coupling, which is noiseless when in use and which enables the thill or pole to be readily attached or detached.

An ingenious combined Cane and Umbrella has been patented by Mr. Alexander Mungle, of Newark, N. J. There is a tubular umbrella stick into which the cane is inserted and retained by a hollow split handle, made of a fixed and hinged section, locked in suitable manner. The runner is locked to recessed or perforated catches of the stick by an axially turning spring sleeve. The arrangement seems to be simple, compact, and convenient.

A new Traction Wheel, patented by Mr. William Trenwick, of New York city, improves on the device patented by him December 3, 1872. The invention consists essentially of a movable web or center section supported on rollers or wheels arranged within a revolving traction wheel of larger diameter, the web supporting an axle made of two symmetrical sections, to one section of which suitable operating mechanism is applied. When traction is applied the position of the inner wheels is changed so as to throw their weight, together with the superincumbent weight of the vehicle and its load forward or backward of a perpendicular line dropped through the axes of the axle, so that the gravity of the load is utilized in moving the vehicle.

A new Truss, designed for supporting abdominal hernia, which may be securely held to the body without liability of becoming displaced or causing irritation, has been patented by Mr. Barak T. Nichols, of Hastings-on-the-Hudson, N. Y.

Messrs. Luther Jones and James Stroud, of New York city, have devised a new Sash Fastener, which consists in a curved spring plate, secured at one end to the edge of the sash, and having lugs formed upon the side edges of its other end, overlapping the sides of the sash. The ends of a roller are so pivoted that its sides may project through a slot in the said spring plate to bear against the casing.

A very handsome and ornamental Glass Panel has been invented by Mr. George Bassett, of Chicago, Ill. It consists of pieces of plain, ground, or colored glass, interposed between face layers of ornamentally cut-out wood.

Mr. Adolph Merkt, of New York city, is the inventor of an ingenious Leaf Turner for music. It consists of a slotted guide casing secured to the piano or music stand, and having a reciprocating rack bar with hinged fingers, worked by suitable mechanism either by pedals or a front button, in connection with an angular projecting center portion of the slot. The guide casing has a hinged front portion that may be opened to swing the fingers into horizontal position for arranging them in the leaves of the music.

PRODUCING CUTTING EDGES FOR TOOLS AND INSTRUMENTS.

BY JOSHUA ROSE, M.E.

No mechanical operation can appear to be more simple than that of grinding a tool to a cutting edge, and hence it is that very few persons have any idea of the large amount of knowledge as well as the skill that may be displayed in simply sharpening a tool. In the first place, to give a tool a suitable cutting edge, one must thoroughly understand the nature of the material to be cut, and must have had some experience in cutting it so as to know what variation to make in the tool to suit the variations in texture, closeness of grain, hardness, etc., which are always to be found in different specimens of the same material.

A cutting edge is formed by the line of junction of the two facets at the point of a wedge. The angle of these two facets one to the other, determined by considerations of strength, and the shape of each facet is determined either by considerations of strength or of shape. As a rule the harder the material to be cut, the more the approach of the two facets to a right angle, one with the other; and so likewise the greater the strength required, the nearer the facets to a right angle. Thus, while the facets of a graver may stand at an angle of 50°, those of the cutters for a pair of shears or a punching machine will stand at an angle of about 85°, though both may be used to cut iron and steel. In this latter case, the strength being the main consideration, it must be obtained at a sacrifice of keenness, whereas, if we take the case of a razor or a lance, sharpness is the main consideration, and strength is disregarded. There are, however, certain considerations in the production of the cutting edge itself, regardless of the angles of the facet, which affect all cutting edges, and these considerations it is which we propose to discuss.

First, then, comes the question as to on which side of a stone a tool should be ground, and this depends upon the shape of the tool, the amount of metal requiring to be ground off, and the condition of the grindstone. If the tool is held in such a position that the revolving surface of the stone runs towards the operator, the operation can be performed quicker, and as a rule better; but it is in many cases quite dangerous, because the edge of the tool is liable to catch in any soft part or a spot in the stone and to be dragged from the fingers, carrying them with violence down to the rest (every grindstone should be provided with a rest) and rendering them very liable to injury by being caught between the rest and the stone. In determining upon which side of the stone any given tool should be ground, the workman takes into consideration the following: the shape of the tool, the amount of metal requiring to be ground off, and the condition of the grindstone.

Upon the edge of a tool which last receives the action of the stone, there is always formed what is termed a feather edge, that is to say, the metal at the edge does not separate from the body of the metal, but clings thereto in the form of a fine ragged web, as shown in Fig. 1, in which A represents a grindstone running in the direction of the arrow, B, and C represents a tool. If now we take a point on the circumference of the stone, as say at F, it should leave contact with the tool at the point of the tool denoted by D; instead of doing this, however, the metal at the extreme edge gives way to the pressure and does not grind off, but clings to the tool, leaving a web, as shown from D to E; whereas, if the same tool were held in the position shown at G, the point, F, upon the stone would meet the tool at the edge first, and would cut the metal clear away and not leave a feather edge. Now the amount of the feather edge will be greater as the facets forming the edge stand at a greater angle one to another, so that, were the facets at a right angle, instead of forming an acute wedge, as shown in Fig. 1, the feather edge would be very short indeed. But in all cases the feather edge is greater upon soft than upon hard metal, and is also greater in proportion as the tool is pressed more firmly to the stone; hence the workman conforms the amount of the pressure to suit the requirements by making it the greatest during the early grinding stage when the object is to grind away the surplus metal, and the least during the later part of the process, when finishing the cutting edge, and hence he obtains a sharper tool, because whatever feather edge there may be breaks off so soon as the tool is placed under cutting duty, leaving a flat place along the edge. It would seem, then, that faces which can be ground in the position, relative to the stone, shown in Fig. 1, and upon a tool of shape similar to that shown in the figure, should always be ground with the stone running toward the cutting edge, as shown in Fig. 1, at the position denoted by G; and so they should, providing that the stone runs very true and contains no soft or hard spots of sufficient prominence to cause the cutting edge to catch, which would render the operation dangerous. These unfavorable conditions, however, are always more or less existent, under average conditions and to such an extent as to forbid the holding of the tool to the stone with the amount of pressure necessary to remove a quantity of metal, as is necessary in the earlier stages of the grinding operation. Furthermore, if the edge of the tool does catch in the stone, the damage to that edge is very serious and entails a great deal of extra grinding to repair it, and at the same time incurs a rapid using-up of the tool. Another consideration is that it is much easier to hold the tool steady, under ordinary circumstances, in the position shown at H, than in that shown at G; and with a bad stone it is altogether impracticable to hold it as at G. Here, however, another consideration occurs, in that the surface of a grindstone is rarely level across the width of the perimeter of the stone, unless the stone has a truing device attached to the frame, which at present is very largely the exception. As a rule the face of the stone is made rounding in its width because there is the most wear in the middle, and it is very undesirable to have the stone hollow across. Suppose. for example that in Fig. 2 we have a stone that is hollow, and in Fig. 3 one that is rounding across the perimeter; then to grind such a tool as is shown in Fig. 1, as say a plane blade, we may move it slowly across the width of the stone, and the highest part of the stone will act upon all parts in the width of the blade: but we cannot, by any method, grind such a tool upon the hollow stone without leaving the cutting edge rounding in its length.

So far, however, we have supposed the stone to have an even surface; but very often this is not the case, and then the operator, no matter which side of the stone he is using, holds the length of the cutting edge of the tool at an angle to the width of the stone, as shown in Fig. 4, placing the tool in the most level part of the grindstone surface. By doing this he effects two objects: first, he obtains a level spot upon the stone more readily, and secondly, he diminishes the formation of a feather edge. The first is because it follows that, in removing a given amount of metal, there will be more abrasion upon the stone in proportion as the operating area of the stone is diminished, hence the workman selects the highest part of the stone whereon he can find a suitable surface, and by moving the tool across the face wears down the asperities while he is roughing out the tool so as to obtain as smooth a surface as possible for finishing process. If he held the tool still instead of giving it lateral motion, it would grind away in undulations or grooves conforming themselves to those on the abrading surface of the stone and have but very little tendency or effect in leveling the the same. Referring now to the second advantage named, it will be readily observed that, if he held the length of the cutting edge in a line with the revolutions of the stone, there would be no tendency to leave a feather edge, except at the corner of the edge where the stone leaves contact with the tool, and this would be of little or no consequence. The question naturally arises, then, why not grind the tool in that position, that is in the position relative to the stone shown in Fig. 5, which would require a very small flat or smooth space in the width of the stone and would avoid the formation of a feather edge. The answer to this is that it is so difficult to grind the surface of the tool level, as will be seen in the side view of the operation as shown in Fig. 6; in which A represents the tool enlarged so as to make the engraving clear, and from B to C, the length of the cutting edge. To bring the whole length of the cutting edge to bear upon the stone it is necessary to move the tool from C

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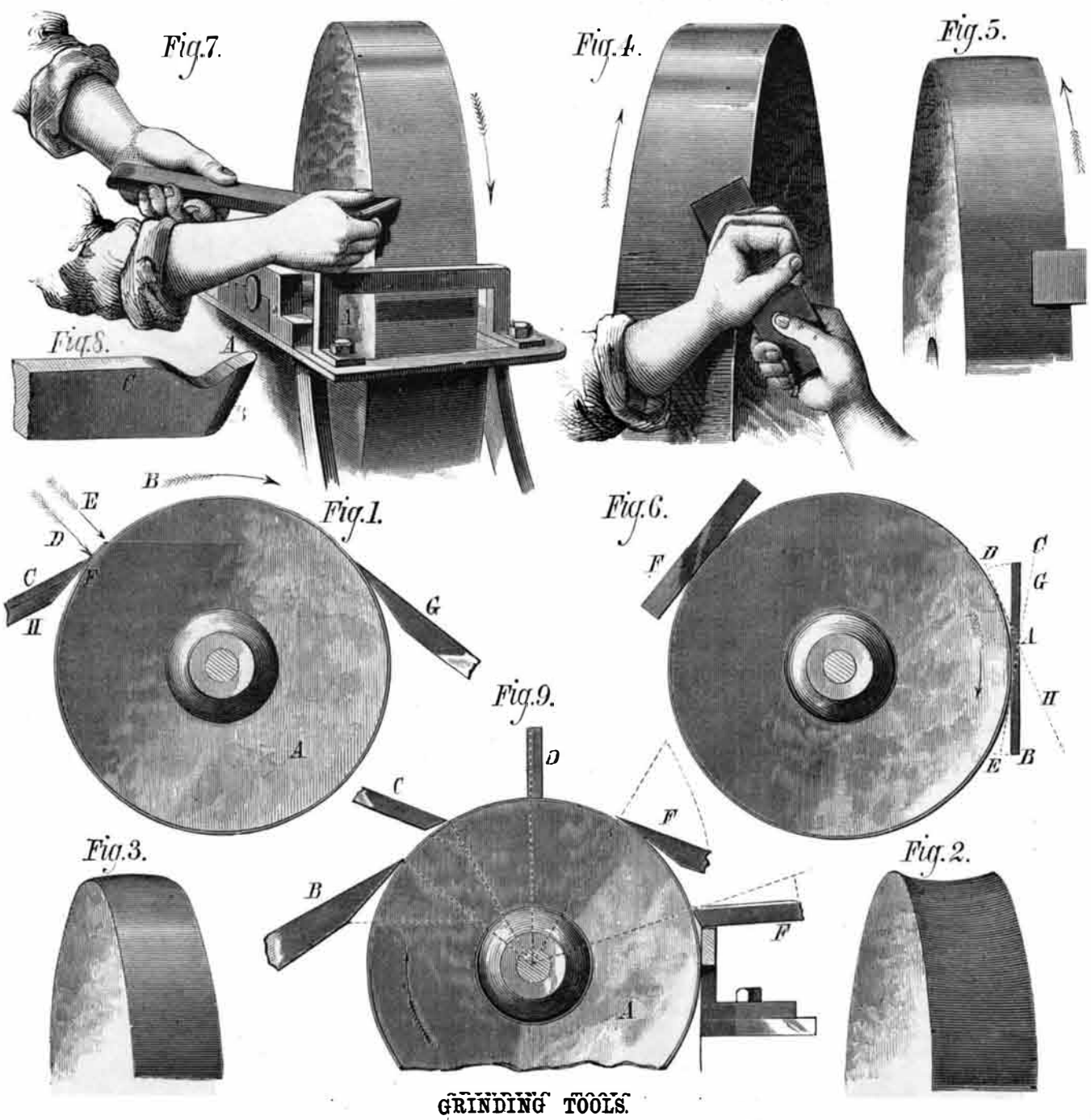
to D, and from B to E, as denoted by the dotted arcs at D, E; and if during this operation the tool remains an instant longer in any or either of the positions indicated by the dotted lines, G, H, a hollow spot will be ground upon the tool at the point of contact between the stone and the tool; furthermore the grinding operation is not very accessible to the eye and hence any irregularities are not very easily corrected. For these reasons it is impracticable to grind in this position any cutting edge requiring to be a straight line and having suffificient length to render much motion in the direction of D, E, a necessity. Furthermore it is very difficult to hold a tool steadily in position shown in Fig. 6, and as a consequence no satisfactory result can be attained unless by the aid of a device whereon to rest the hand; such a device is called a rest and is shown in Fig. 7, at A. Now suppose we have a tool of the form shown in Fig. 8, requiring to be ground on the faces, A and B; then it is evident that A can only be ground with the body of the steel, C, out of the way of the body of the stone and hence in the position shown in Fig. 7, in which position the tool may be held firmly and pressed firmly to the stone. It is necessary, however, to rest the hand upon the rest and hold the tool exactly in the position shown in Fig. 7, so that if the tool catches in the stone and is forced from the hand it will not carry the fingers with it, and wound them by jamming either against the stone or the rest, or force them between the two. It would seem advisable to rest the tool upon the rest without the intervention of the hand, but such is not the case, because the operator would not have sufficient control over the tool and it would almost assuredly catch in the stone. By interposing the hand between the tool and the rest, the sense of feeling is brought into play, guiding the operator just how to hold the tool to prevent its catching in the stone and admonishing the operator when the conditions possess any elements of danger, which become instantly known from any difficulty in holding the tool steady against the grip of the stone or from a disposition of the upper edge of the tool, which the stone meets, to turn in towards the stone.



GRINDING TOOLS.

Such are the main principles involved in the art of tool grinding, and we may now proceed to make some practical applications of them. First, then, to define the point which distinguishes whether the stone is running to or from you, let A, in Fig. 9, represent a grindstone, and B, C, D, E, and F, tools held thereon; and if a radial line from the center of the stone forms an obtuse angle with the face of the tool which first meets a point on the periphery, or face of the stone, as it is usually termed, then the stone is running from you; while if, on the other hand, that face forms an acute angle to the radial line, then the stone is running from you, no matter in what position in regard to the stone you may stand. But common prudence teaches one to stand as clear of the rest as possible when grinding with the stone running from you.

In ordinary shop parlance, the side of the stone on which the face of the stone enters the trough is always called the side with the stone running to you, because all grinding which requires performing with the stone running to you is performed on that side, and in conjunction with the use of the rest shown at A in Fig. 7. There is no excuse, and it is very dangerous, to grind on that side of the stone without using the rest as a steadying point, and as a safeguard. With the rest, the grinding can be more delicately, truly, and accurately, as well as expeditiously, performed, because of the extra force with which the tool can be held steadily to the stone.

In Fig. 9, B and C are ground with the stone running from you, D is neutral, and E and F are ground with the stone running to you. Henee, while with the stone running to you the greater the angle of the front face of the tool (that is, the face which has the grindstone running towards it), the greater the liability of the tool to catch in the stone and the more difficult it is to hold the tool steadily, while the reverse is the case when the stone is running from you; and it follows that as the length of the cutting tool edge is greater, the more difficult it will be to hold the tool in the positions of D, E, or F. Therefore tools having broad cutting edges formed by acute angles should be ground in the position of B, unless, indeed, the stone is very true and smooth, and has no soft spots, in which case it is permissible to grind them held in a position relative to a radial line of the stone similar to that at E in Fig. 9; but in this case it is well while holding the tool at that angle to grind it in that part of the circumference of the stone occupied in Fig. 9 by D, or between that and the position occupied by E, so that, should it chance to catch in the stone, it will not drag or force the fingers down to the rest. We may now consider what effect the size of the work has upon the position, relative to the stone, in which it should be ground, by giving a few examples of grinding. In the case of very small articles we may use almost any part of a true stone, because the hand has comparatively a thorough control of a small article.

To grind the sides of a square bar for any distance extending not more than an inch or so from the end, the position shown in Fig. 7 is correct, and the same position applies to similar work upon a round piece of work, the hand upon the rest serving to steady it while the other hand causes the object to revolve. In this way the piece can be held steadily while considerable pressure is applied. To grind the end face of any bar the bar is always placed upon the rest, as shown in Fig. 9 at F, but care should be taken to move the bar to various positions along the face of the stone or slowly to revolve it, causing it to travel across that face, otherwise a groove will be worn in the stone. To grind the surface of a bar, it should be held in the position shown in Fig. 4, because, if held square across the stone, it could not be held at all steadily, especially if pressed heavily to the stone. It is highly dangerous to attempt to grind the outside of a bar by placing it on the rest or in any position in which the stone would be running to, or, rather more properly, toward you. Any work requiring to be ground to a point must be held in the position shown in Fig. 1, at H, or in that shown in Fig. 7. In the first case, however, it should be moved across the face of the stone, as the grinding proceeds, to prevent the wearing of a groove in the stone. The surface of sheet metal or plates should be ground in the position occupied by D, in Fig. 9. The cutting edges of all blades should be ground in the position shown in Fig. 4, because they can be held steady, and, if held lightly towards the finish, with a small amount only of feather edge. All turning and planing tools should have their top faces ground as in Fig. 7, and the other faces as at F, in Fig. 9, because such tools must be held steadily and require the removal of considerable metal at each grinding. All drills should be ground upon the ends while upon the rest, excepting the faces of flat drills, as at H, in Fig. 1, while the diametrical edges must be ground as in Fig. 7. Anything that is sufficiently long to afford a *firm grip* with both hands when standing in the position of F, in Fig. 9, may be ground in that position, providing that the top of the rest is close to the perimeter of the stone. All blades requiring a keen edge must be held lightly to the stone, to avoid getting broad and thick feather edges. The edges of blades or plates not required to have a cutting edge may be ground in the position shown at I, in Fig. 6, or slanted a little, as in Fig. 4.

After a tool is ground it is often necessary to remove the feather edge without having recourse to an oil stone. Machinists often accomplish this object by drawing the cutting edge across a piece of wood, holding the cutting edge parallel with the line of motion, which removes the feather edge without breaking it off low down, as would be the case if the length of the cutting edge stood at a right angle to the line of motion.

When a smoother edge than can be produced by the grindstone is required, recourse must be had to the oil stone. In using the oil stone it is highly important to keep the facets being stoned level with the face of the stone, but with the surface near the cutting edge of the tool pressed a little the hardest to the stone. Even with the utmost care we cannot avoid forming upon the tool what is termed a wire edge. A wire edge is really a burr formed of the extreme edge of the tool giving way and bending over towards the face not in contact with the stone. To reduce the wire edge as much as possible, we press the tool very lightly to the stone during the latter part of the stoning and turn the tool frequently over. If the motion of the tool upon the oil stone is parallel with the line of cutting edge, the wire edge will be greater than if the line of motion were at a right angle to it.

Again, the strokes performed while the cutting edge is advancing upon the oil stone produce less wire edge than the return strokes, hence the finishing process consists of a few light strokes upon one and then upon the other facet repeated several times. Now let it be observed that the wire edge will never be turned toward the facet last oil-stoned, and cannot be obviated by the most delicate use of the stone, but after the stoning proper is finished, the operator will lay one facet quite level with the face of the stone, and then give to the blade, under a very light pressure, forward diagonal motion, and then perform the same operation with the other facet upon the stone, the last facet operated upon being usually the straight and not the beveled one. To still further reduce the wire edge for very fine work, the operator sometimes uses a piece of leather belt, either glued to a piece of wood, as upon the the lid of the oil stone box, or some attach it at each end to projecting pieces of wood, while yet others lap the tool upon the palm of the hand. In giving an edge to a razor, the process may be carried forward in the usual way by means of straps, the first strokes being long ones made under a slight pressure, the strokes getting shorter and the pressure lighter as the process proceeds, until at last the motion and contact are scarcely perceptible.

THEOBROMIC ACID is a new fatty acid from cocoa butter.

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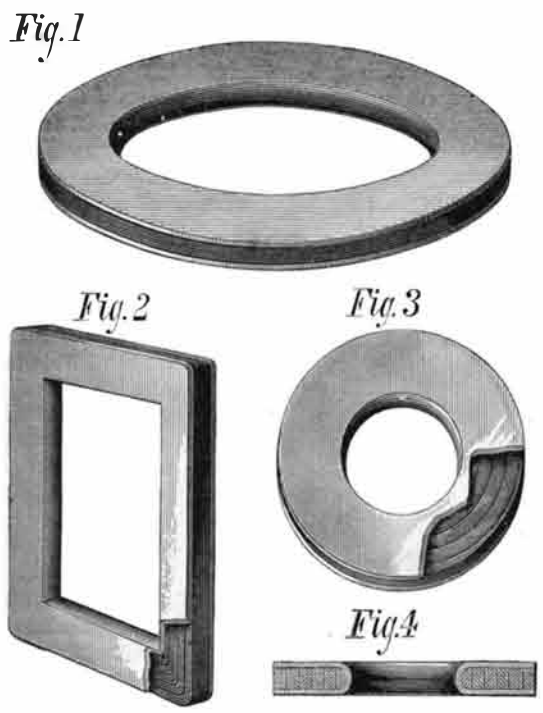
STOY'S IMPROVED GASKET.

In the annexed illustration we present a new gasket for packing joints of pipes, hand holes, etc., which is very simply constructed, and which can be made in several different forms as called for by different requirements. Thus Fig. 1 shows the elliptical shape, Fig. 2 the square, and in Fig. 3 the circular form is exhibited, and also the interior construction, which will be more clearly understood from the section, Fig. 2. The device consists of thin annular plates having formed on their inner edges lips, by which they are united, so as to leave a thin piece between them for receiving elastic



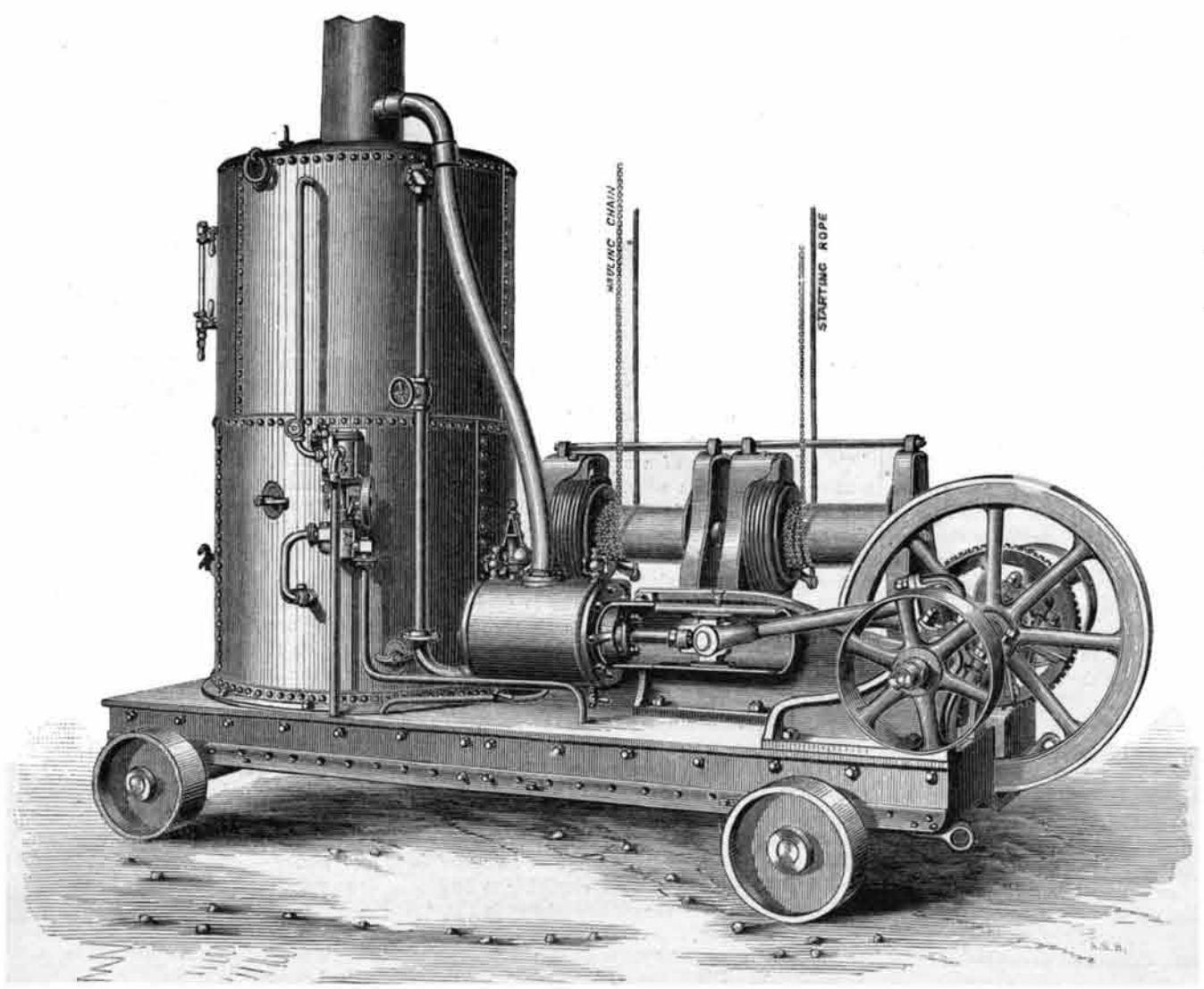
packing, which is a strip of rubber or any other suitable material. Both of the annular plates may be made from a single sheet of metal by the process of spinning.

The advantages claimed are that, when this gasket is clamped between pipe flanges, or between hand hole covers covers and their seats, a tight joint is formed, which cannot be blown out. The packing is protected by the metallic covering, so that it is not acted upon by steam, fluids, or gas. The joint may easily be tightened by caulking from the outside; and in taking the joint apart, there being no elastic packing in contact with the face, it may be readily removed without tearing or injury, and thus may be used for years without renewal.

Patented through the Scientific American Patent Agency, October 23, 1877. For further particulars, address the inventor, Mr. C. S. Stoy, Butler, DeKalb county, Ind.

PORTABLE HOISTING ENGINE.

This is a new type of contractor's portable engine and hoist, constructed in England. As will be seen from the illustration, which we take from *Engineering*, it consists of a cast iron frame and water tank, mounted on four wheels for convenience of transport, and for shifting from place to place on the work upon which it is employed. The boiler is vertical, 4 feet 3 inches in diameter, 7 feet 6 inches high, and fitted with two cross tubes 10 inches in diameter, and 34 hanging tubes 2⅛ inches in diameter. The engine is horizontal, with a cylinder 10½ inches in diameter, and 14 inches stroke. Two hoists are placed upon the frame, but these can be removed at pleasure. They are driven from the engine by bevel gear, and are thrown into action by means of an eccentric connected to levers, from which a starting rope can be led off to any desired position, so that the man receiving the load from the hoist has the latter under control, although not near the machine. It will also be seen that the engine is adapted for general work.



PORTABLE HOISTING ENGINE.

An American Palace Car in Norway.

In a description of the opening of the extension of the Norwegian State Railroad to Trondhjem, the *Aftenbladet*, published at Christiana, Norway, thus speaks of the palace car recently sent out by the Jackson & Sharp Company, of Wilmington, Del.:

"The royal car moved throughout the entire trip with wonderful steadiness and uniformity, in fact to such an extent that His Majesty King Oscar was able for quite a period to carry on his regular correspondence without being disturbed by any jolting or unpleasant motion of the car. In order that the public might examine the royal car, it was put upon a siding after the completion of the trip, so that ladies and gentlemen desiring to do so might have a good view of it inside and outside. It was, in fact, full of curious visitors all day and was much admired. The royal car, as is well known, is the first railroad car in this country of the American pattern. It possesses great practical advantages, both as regards comfort and convenience of passengers and the train hands."

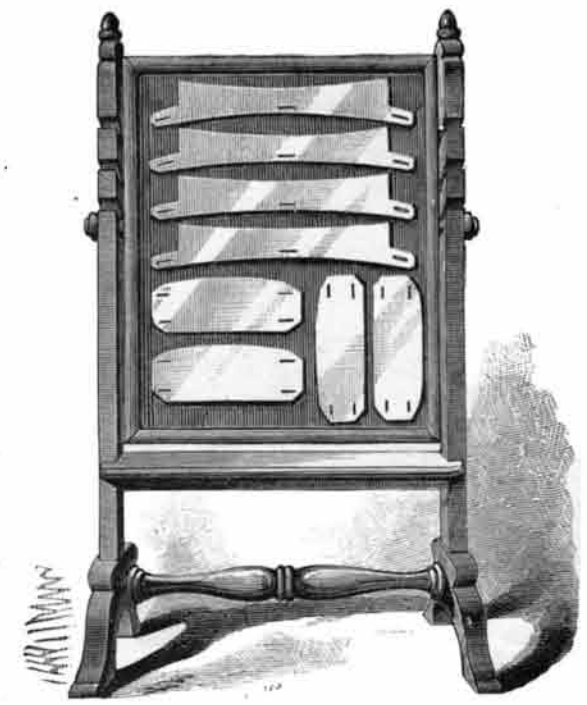
The Elevated Railway Outrage.

We cannot recall in our time so gross an infringement on the rights of the people in relation to their property as is now being perpetrated in the erection that is to disfigure and otherwise damage several thoroughfares throughout the length of this city, for the benefit of a clique of stock speculators and out-of-town landowners. We do not believe that this railway corporation has any legal right to erect its structure in Pearl street. When a street is opened for all kinds of public uses by compensating the landowners for the property thus taken, the government which represents the ownership of the acquired domain may authorize the erection thereupon of anything which will not interfere with such use. But when the landowners themselves open for their own convenience a thoroughfare through their property, asking no compensation for the land, all that the public can acquire by such a concession is the right of way. Pearl street was thus thrown open by a voluntary concession, and neither the city nor the State ever had the right to grant a franchise for any sort of structure on this thoroughfare without compensation therefor to those who own the fee. But even if the government could do this, the right has been most wantonly exercised, with no proper limitations, and with a recklessness of both public and private interests which is simply astounding.

Not only are sidewalks broken up, but vaults which have been constructed at great expense are wholly ruined, the foundations for the railway structure going directly through them, without reference to the damage thus inflicted on their owners. Millions of dollars will not compensate for the loss and damage brought upon property holders in thus seizing the right of way through streets most valuable for business purposes. We wonder that so many of our most substantial citizens can look on and see this wanton outrage without a protest. It needs no prophet nor the son of a prophet to predict that they will suffer from this indifference one day in the return of the cup to their own lips. The people of New York will bitterly repent some day of this gross injustice, but the monopoly they have created, having seized its prey, will care nothing for their penitence.—*New York Journal of Commerce.*

IMPROVED STAND FOR SMOOTHING FABRICS.

The invention herewith illustrated is a new device for smoothing and glossing fabrics. It consists in an adjust-



able frame or smoothing board, which is pivoted to a standard and constructed with a metallic surface, on which the moist and starched fabrics are smoothed and dried. The supporting frame is formed of two standards connected together by two horizontal bars. The inner sides of the standards have L-shaped grooves cut in them, adapted to receive pivots, which are fixed to the sides of rectangular frame surrounding a smoothing board. The latter consists of a backing of solid material which is covered on one side with prepared metal. The board is adjustable, so that it can be set at any desired angle from a horizontal plane, and raised or lowered.

The invention is used as follows: Goods, etc., being washed and starched, are spread on the metallic surface and gently smoothed from the center outwards to disperse air blisters and to cause them to adhere closely. The board is then placed near a stove or in the sun to dry, when they will come loose and drop off ready for wearing. Should a gloss be desirable, thick starch is used and the goods are allowed to dry slowly, without adding any chemicals or preparation for glossing. After use the board is washed with clean water and soap, and is then again ready to receive another set of garments.

Patented through the Scientific American Patent Agency, October 2, 1877. For further information address the inventor, J. F. Freese, N. W. cor. of Gay and Eden streets, Baltimore, Md.

THE removal of tin from copper vessels coated therewith can be easily accomplished, according to recent investigations of Professor Bottger, by immersing the vessel in a concentrated solution of sesquichloride of lime. Scour afterwards with sand and dilute hydrochloric acid.

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THE FRINGED BIRTHWORT.

The fringed birthwort, of which we take our illustration from *The Garden*, is one of the large genus Aristolochia, of which there are 200 species. The greater number come from tropical America; in North America, Europe, and India a few are found. Many of these plants attain too great a size to be easily cultivated, and the generally dingy color, together with their disagreeable odor, render them undesirable. The leaves of the fringed birthwort are characterized by the nerves being surrounded on the upper surface by whitish zones, this coloring being due to the presence of a film of air under the epidermis. The outside of the perianth is greenish and the interior brown-purple crossed with greenish veins. The half-climbing stems grow from 1 foot to 2 feet long, and the flowers are produced in July and August. Being a native of Brazil, it grows best in a warm house.

A CURIOUS HYBRID.

Our engraving represents a curious family, consisting of an African zebra, an Abyssinian ass, and their hybrid foal. The young animal resembles both parents, its color being grayish inclined to fawn, and its legs showing very clearly the zebra stripes. The crossing of the zebra and the ass is in accordance with the law that the most frequent and most useful forms of hybridity occur between different species belonging to the same genus. The horse, for example, will breed with the ass, the zebra and the quagga; the dog has been certainly known to breed with the wolf, and probably with the fox; the goat with the sheep, the ram with the roe; and it has been comparatively easy to obtain hybrids from the union of the rabbit and the hare.

As a rule however hybrids are not fertile. Thus the mule does not reproduce itself, but is only obtained by a repetition of the union of the ass and the mare. Between horse and ass, however, there is a wider gulf than between the zebra and ass, and therefore the chances of the hybrid of the latter having the faculty of reproduction are more favorable.

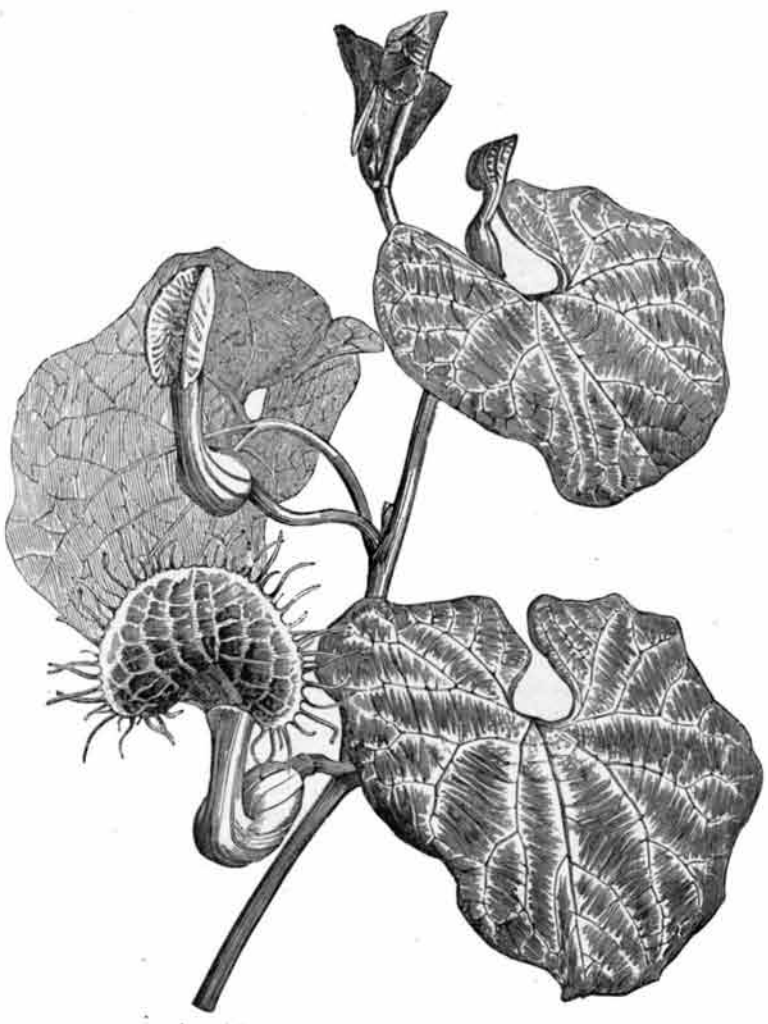
It was noted that the period of gestation in this case extended to 11½ months, or about fifteen days longer than that of the mule. The animals are at the Berlin Zoölogical Garden.

We are indebted to the London *Sporting and Dramatic News* for our illustration.

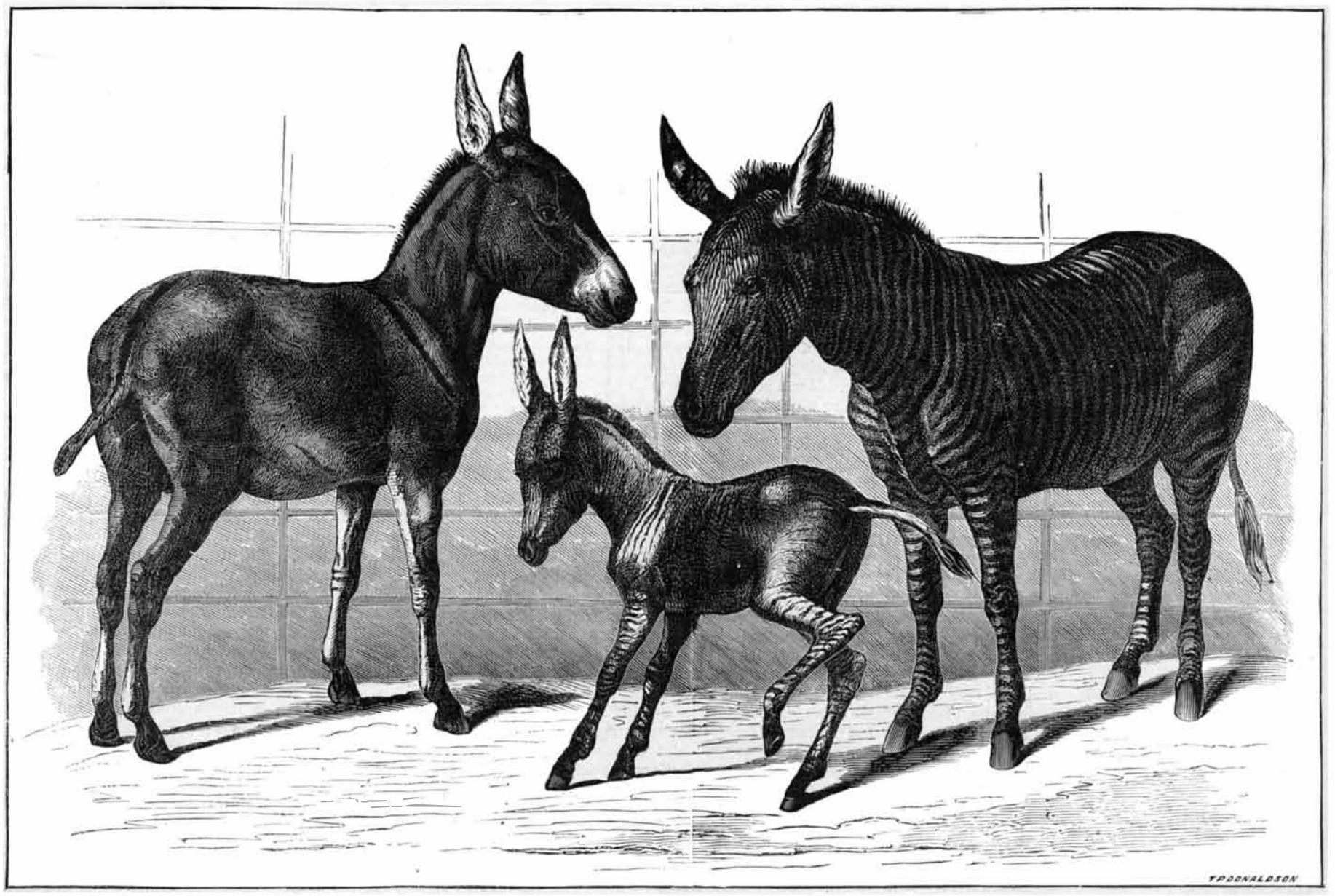
A Decorative Process.

The latest and one of the most successful efforts in art decoration we have seen has been introduced by Mr. Aldam Heaton, of Bloomsbury square, who has applied hand painting in a way that will find favor among architects and their patrons desirous of favoring the art decoration of interiors, in contradistinction to the "manufacturing" processes. Having seen some of Mr. Heaton's work, we can explain it simply by saying it is a kind of raised or gesso painting on panel, applicable to interiors of houses of a superior class. The work we saw was done on oak and pitch pine; and for the decoration of paneled work it is extremely suitable. One panel on pine was an admirable rendering in a naturalesque spirit of the oak and mistletoe, entwined or blended in a pleasing and thoroughly artistic manner, in which the leaves and berries were raised or painted in relievo, the raised parts being discriminatingly juxtaposed with the portions flatly represented. The preparation of gilded gesso is, we believe, chiefly composed of lime mixed with oil and other ingredients, and productive of a remarkably fine surface. The colors chosen in the panel we saw were in a low scale—the leaves were of a bronze hue depicted in transparent colors or glazings upon the gilded ground, while the groundwork, or panel itself, was apparently stained with a dark color transparent enough to show the natural grain of the wood.

There is a remarkably pleasing solidity and cabinet picture-like effect in the work, which the smoothness and polish and transparency of the ground enhances. Another panel was treated with a lighter ground, the surface of the wood being apparently grounded with gold. The figure subjects treated by this process have all the beauty and finish of cameos or alto-relievos, owing to the polish of surface and reflection thereby caused. Mr. Heaton has recently executed a fine series of this panel painting for Mr. Ripley, M.P. for Bradford, for the billiard, smoking room, and other apartments of that gentleman's residence, "Acacia." The rooms are divided into panels by pilasters of conventional folial patterns, and contain subjects of rural pastimes and sports—boys climbing, hunting, fishing, shooting, etc., after the model of Luini. Above this a frieze of foliage, children, birds, etc., is formed. The process has certainly more of the finished cabinet picture of oil, than the decorative and flat treatments that have recently been introduced for woodwork. Stamped leather supplies some analogy to it. We are informed that the best and highest class of subject can be done in this manner for about £5 per superficial foot, though of course the cost varies with the subject and the labor bestowed. One immense gain in this kind of art decoration is that it cannot fall into the hands of indifferent or manufacturing decorators, as its value consists in the high class hand work of the artist.—*Building News.*



THE FRINGED BIRTHWORT.



A CURIOUS HYBRID.

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Cop Waste.

Many times in walking through weaving sheds have we noticed the large amount of waste made from weft, generally called "cop bottoms." We are mostly met by the reply that this cannot be helped, and that, though excess is punished, a certain amount is inevitable; still, from what we have seen, we are of opinion that the average amount of cop bottom waste is too much, and might, if properly looked into, be much reduced. It is our intention in this article to inquire into the cause of so much waste, and to see whether and how this could be removed.

When we look at the way a cop is formed on the mule, where every layer of the yarn has a different position, where these layers are constantly crossing each other, and thus kept from getting entangled, it looks, at first sight, the simplest thing in the world to unwind this yarn down to the last turn, and yet such is not the case. True, the yarn, after the cop has been placed upon the tongue of the shuttle, is steadily drawn through the eye which faces the point of the shuttle tongue; but though the eye and this point always retain the same position, the relative positions of this point and the yarn where it comes from the cop are constantly varying. When the cop is full, the angle from the circumference of the cop to the point of the spindle is a greater one, while the turns of the yarn round the tongue are fewer than when the cop is nearly finished; thus there is more strain upon the yarn in the latter case than in the former, and any obstacle which prevents its unwinding is of so much greater effect. When the yarn in the mule is wound upon the cop, it is guided by the faller wires, which are in close proximity to it, and give it support, but when being unwound in the shuttle, there is no such assistance, and all the pull emanates from the point of the shuttle, which sometimes is three or four inches off. There is also this difference between the winding on and the winding off of the yarn, that in the former case the spindle turns, and the yarn is more passive, while in the latter the shuttle tongue is fast, and the yarn is active. Still, there seems to be no reason why moderately strong yarn should not unwind to the last turn if the cop could be placed into the shuttle exactly the same way as it was in the mule: but, from what we have seen, we believe the cause of the waste to lie in this direction. If, in putting the cop upon the shuttle tongue, one or more of the internal layers of yarn are displaced, they must, to a certain degree, entangle the yarn there, and thus produce an extra strain, which causes the yarn to break; and we know that, though the small remaining part of the cop might sometimes be easily unwound, it is easier for the weaver to pull it off, and throw it into the waste box. It, however, often occurs that the lower or inner layers are considerable displaced, so that a larger remaining part of the cop cannot easily be unwound, and thus form a large amount of waste.

The displacement of the lower and inner layers when on the shuttle tongue seems, therefore, to be the main cause of the waste; but how is this produced? Naturally in putting the cop upon the tongue. But we ask again, Is there any necessity for this displacement, or cannot the same be avoided?

While the yarn is on the spindle in the mule there is no tendency to pull it off; rather the reverse; but in the shuttle there is a constant drag, which would take the cop at once off the tongue if it was not held by some means. This is mostly accomplished by supplying the tongue with a bow-spring, which presses upon the inside of the cop, and thus prevents its slipping from the tongue. As the tongue with its spring must of necessity, when expanded, be of larger diameter than the inner aperture of the cop, it stands to reason that a certain amount of force is required to push this tongue into the cop, the middle of the spring being higher than both ends; this force causes friction, and displaces easily any layers of the yarn which in packing or removing of the cops may have got loosened.

In order to facilitate the insertion of the tongue the weaver generally takes the cop in her left hand, and, holding the shuttle in her right, screws the tongue into the cop. It thus often happens that the lower end of the cop is compressed, and a part of it carried a little inside, which makes it quite impossible to unwind this part of the cop. It is true that, with great care, the weaver can avoid, to a certain extent, this displacement of the yarn, but such extra care can hardly be expected of her when we consider the little time she has for copping the shuttle. An ordinary cop of 42's weft, weighing about 200 grains, contains about 1,010 yards of yarn. If we take a 45 inch loom, making 40 inch cloth, and running 200 picks per minute, and allow one third for stoppages, we have a consumption of 134 picks per minute of 40 inches each, or 150 yards of weft; at this rate a cop lasts 6½ minutes.

Assuming that a weaver minds three looms, each consuming the same quantity of weft, we have three changes of shuttles in 6½ minutes, or a little over 2 minutes per loom, including piecing of warp-ends and all other eventualities. We cannot, therefore, be hard with the weaver if she performs the operation of putting the cop upon the shuttle in a hurried manner, and necessarily injures the cop. A large production of cloth is more important to her than a little more waste, but it is not so to her master. We find that on an average, weavers, when moderately careful, make from 3 to 6 per cent of waste in 42's cops. This waste is sold at about 3½d. per lb., while the yarn costs about 9¼d. If now a weaver makes per loom about 12 ozs. of waste, and this could be reduced, say one half, it would give at the difference between 9¼d. and 3½d.., a saving of 2d. per loom per week, or £1 13s. 4d. on 200 looms per week, and £84 per year.

We think we are not wrong in ascribing a large share of this waste to the imperfect construction of the tongue of the shuttle, which, in most cases, is still in a primitive condition, and has not been improved upon during the last fifty years. From what we have shown above, it will be seen that the careful insertion of the tongue of the shuttle would be much facilitated if the former was perfectly smooth and even, and of the diameter of the spindle which—often only a few hours previously—had left the cop.

There is a tongue, patented some years ago by Messrs. Butterworth and Brooks, in which, when it is turned up for receiving the cop, the spring lies quite flat against the spindle, thus passing easily into the cop, and in which the spring only bends out when the tongue is depressed into the shuttle with its cop on. This tongue has many advantages, but still is not so generally used as one would expect, and there must, therefore, be disadvantages, or, perhaps, prejudices, with which we are not acquainted. But the ordinary tongue is, in our opinion, still very imperfect; it is forged by hand, and the spring brazed on also by hand, the whole a clumsy and unmechanical contrivance. Why cannot this tongue be made of, say, rolled steel, and the tongue attached in such a manner that the whole is turned out by a machine, even and smooth, and in such a condition as corresponds with the present advanced state of mechanics? We think when this tongue has to take the place of the mule spindle, which is highly polished and finished, it should, at least, not be inferior in finish to the latter.

Mr. Hugh Mason mentioned at the meeting of the Manchester Chamber of Commerce, on the 29th of last month, that we must have greater economy in production if we are to hold our ground; a saving of 8s. per year per loom is not much, but is still a matter important enough to be seriousiy considered, especially when we know that with many weavers the amount of waste is more than stated above.

We have thrown out these hints to induce our friends the shuttlemakers to make researches with a view to improving the tongue, for we regard it as our mission to contribute our mite in every possible way to the continued progress of the textile industries and everything connected therewith.—*Textile Manufacturer.*

New Mechanical Inventions.

James A. Albright, of Fayetteville, Lincoln county, Tenn., has patented a supplemental rock drill designed to be used after the ordinary drill, for the purpose of enlarging the hole at the bottom to form a large chamber for containing the blasting material. The improvement consists in cutting blades arranged in guides in the drill stock in connection with a spring-seated end piece, so as to be projected laterally from the stock of the drill by the impact upon the end piece, and be again withdrawn into the drill stem by the action of the spring when the drill is drawn back.

A new Carriage Axle Box has been patented by Mr. William A. Sitton, of Cleburne, Texas. The spindle has a circular shoulder or boss near its inner and larger end, and a screw hole is tapped in its outer end. A shouldered sleeve, or box, fits over the spindle, and detachable rings are also slipped on it, being interposed between its shoulder and the shoulder of the sleeve or box. The nut which holds the box on the spindle has a tap that screws into the end of the spindle and around which is formed a recess to receive detachable rings. By removal of one of the rings at each end of the spindle, the box may be adjusted on the latter to compensate for wear.

A Furnace Door for Steam Engines, patented by James M. Marshall, of Knoxville, Tenn., is opened and closed by means of a jointed and spring-acted treadle depressed by the foot of the fireman, the treadle working a slide block and moving a spiral groove of the shave or pivot rod of the door. It will prove an invention of value to engineers, affording a quick method of opening and closing furnace doors.

Jacob S. Baker, New Freedom, Pa., has patented a lift pump, in which is combined a pump with a motor for operating the same, as to permit of the storage of power in the motor and afterwards allow it to be expended for the operation of the pump from time to time as occasion requires. In attaining this end a set of spur wheels is arranged in a suitable case and geared so as to be driven either by a heavy coil spring or weight. To one of the rotating shafts of the gear wheels is attached outside of the case a disk and wrist pin, which latter through a connecting rod reciprocates the pump piston, the latter being made hollow and bent around into a spout at the top, so as to form a conduit for the water from the cylinder of the pump tube, which is located below in the well. To compensate for the increased work of the motor on the upward stroke in lifting the hollow piston full of water, a counterbalance is employed on one of the shafts to render the action of the motor uniform, and to start and stop the action of the same a detent is employed.

A Watercloset Valve invented by Paul Magnus, of New York city, consists of a valve operated by a center stem and having two interior valves, a larger one to open or close the main supply pipe, and a smaller one to supply or discharge, in connection with suitable channels, a water chamber intermediately between the larger and smaller valves. The center stem acts on the smaller valve, removing the pressure of water from the larger valve, permitting it to open. The closing of the small valve secures the filling of the water chamber and the closing of the main valve by the pressure of the water. The water supply is easily regulated by a screw plug, and any hammering is prevented.

Ralph K. Ent, of North Topeka, Kan., has patented a Millstone Balance. The millstone is fitted with a number of symmetrically arranged horizontal guide tubes with adjustable weights, and a separate number of symmetrically arranged vertical guide tubes and adjustable weights for adjusting the standing and running balance of the stone without one interfering with the other. The stone may thus be kept balanced with little trouble.

Mr. Simeon Duck has recently obtained a patent for improvements on the Mortising Machine previously patented by him (December 21, 1875). The new feature is the segmental gear which rocks upon a journal on the main shaft, and on which the table tilts while sliding freely upon it. This materially simplifies the invention.

In a new Lift Pump, Mr. Augustus Johnson, of Morristown, Ill., constructs the plunger, and also the check valve box, with two valves, all four valves opening upwards. The object is to use auxiliary valves which will check or trap the the water drawn into the cylinder and prevent it from flowing back.

A new Steam Atomizer, for impregnating the air of surgical operating rooms, hospitals, etc., with antiseptic vapors, has been devised by Messrs. Peter Rundquist and Theodore Angelo, of New York city. A vessel with antiseptic liquid is supported on clamps on a main pipe, and connected by a flexible conduit with the spray tube for raising and dissipating the liquid in the usual manner.

A new Ironing Machine, patented by Mr. Henry Monk, of Troy, N. Y., embodies numerous novel and ingenious features. The shirt, the front of which is to be ironed, is first clamped and tautened in a suitable device. It is then carried under rolls which are heated and rotated in different directions, and then returned under said rolls and polished.

A new Machine for Rolling Tubes and Bars, devised by Messrs. J. O. Butler and Ambrose E. H. B. Butler, of Kirkstall Forge, Leeds, England, is an improvement on similar devices patented in England by J. Robertson, December 20, 1869; by G. W. Dyson and H. A. Hall, October 31, 1870; and in the United States by Jacob Reese, June, 1867. A prominent feature of the invention consists in the use of a table or rocking frame on which the bars are placed after leaving the machine, and on which they are made to roll forward and backward while cooling to prevent warping, and to keep them true.

Mr. Samuel T. Shankland, of Laramie, Wyoming Territory, has improved on his Steam Plowing and Scraping Attachment to Cars, which he patented April 24, 1877, so that the scrapers may be dumped automatically at any distance from the back. By this device the men attending the scrapers have merely to fill them, and thus time and labor is saved.

In order to Protect Vessels Against Torpedoes, Mr. John H. Fisher, of Mount Washington, Ind., proposes to surround the hull with a series of pipes to be filled with air or water. These pipes, coming in contact with submerged torpedoes, cause the explosion of the same without injury to the vessel.

The object of a new Hydraulic and Wire Rope Pumping System, invented by Mr. W. P. Barclay, of Virginia City, Nevada, is to provide an economical means of raising water from mines and deep shafts. As many pumping cylinders are used in the mine or shaft as may be required to lift the water. These are placed one above the other, and connected so as to divide the pressure between them. Two series of pumps are employed, the piston rods being connected by wire ropes; and a hydraulic engine is located near the mouth of the shaft. The discharge pipe of the lower pump delivers the water to a receiver, from which the suction pipe of the next pump above takes it, and it is delivered to another receiver, and so on until it reaches the top of the shaft.

A new Oven Lamp for illuminating bakers' ovens, devised by Mr. Thoro W. Greenleaf, of Westborough, Mass., consists in an adjustable tubular bracket to which an oil reservoir is connected, outside the wall of the oven. Inside the oven wall there is a burner and reflector.

A new Saw Handle has been patented by Messrs. J. N. Dudley and John Anderson, of Petrolia, Cal. It consists of a handle attached to the saw by binding straps entering recesses of the saw blade, and being secured to the handle and saw by a clamp bolt, with lower crosspiece and upper second handle, or by a fastening nut.

Mr. Wiley J. Johnson, of Hernando, Miss., has patented a new Gin Saw Filing Machine, by which the files may be readily adjusted to the saw teeth at the proper distance and inclination, so as to produce the most favorable action in the down strokes, and exert a less pressure in the up strokes.

Mr. William H. Lynn, of Freeport, Ill., is the inventor of a Car Starter which is an improvement upon the device in which a ratchet wheel upon the axle is combined with a segmental lever carrying a weighted pawl and a chain arranged about the segment to cause the pawl to engage with the ratchet to turn the axle at a greater advantage of leverage.

A new Machine for Scaling, Cleaning, and Polishing Wire has been invented by Mr. Nickolaus Betz, of St. Ingbert, Germany. It avoids the use of sulphuric acid, and consists essentially of a claw guide and a set of vertical and horizontal stretching and cleaning rolls, over which the wire is drawn to be cleaned of scales on all sides. The wire is then passed through a box filled with a mixture of calves' hair and sand.

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NOTES OF THE PATENT DECISIONS OF THE COURTS.

The Cawood patent for an "improvement in the common anvil or swedge block, for the purpose of welding up and reforming the ends of railroad rails when they have exfoliated or become shattered from unequal wear," has again been construed and its validity sustained by the Supreme Court of the United States in five suits brought by Turrell against the Illinois Central Railroad Company and four other companies respectively.

The drawing annexed to the Cawood patent represents a bed sill on which is placed an anvil or swedge block of cast iron, across the face of which there are recesses or dies shaped like the side of the rail to be repaired. A solid and fixed block, cast as part of the anvil, is also represented with its side face shaped to the side of the rail when placed in its natural position, and a movable press block held down upon the anvil by dovetailed tongues and grooves, and operated by two eccentric cams, moving it back and forward, towards and from the fixed block. The face of the movable block is also shaped to fit the side of the rail next to it, and the blocks grasp the rail on each side while its ends are being reformed, the movable one having sufficient travel to allow the rail to be extricated without altering its vertical position.

The mode of use is as follows: The rail and the piece of iron to be welded on having been heated, the former is swung from the fire into the open space between the blocks, when, by half a turn of the cams, the blocks are closed upon it. The welding piece is then laid on top of the rail and leveled up by a swage held by the smith. The claim of the patent is for "the movable press block, having its edge formed to the sides of the rail, in combination with another block with its edges of a similar but reversed form (the movable block to be operated by two cams, or in any other convenient manner), for the purpose of pressing between them a T or otherwise shaped rail."

Viewing the claim as interpreted by the description and drawing, it is not difficult, the court thinks, to discover what the patentee supposed he had invented. It was not any kind of movable press block combined and operated in any way, with any kind of fixed block, to effect any useful result. His avowed purpose was to form a mechanism for welding up and reforming the ends of exfoliated and crushed rails, or, rather, to hold them in a convenient position for such welding and reforming, at the same time preserving their shape. His manner of accomplishing this result was evidently considered by him as of the very essence of the invention. The rail, when on the anvil, is to be confined on three of its sides, as in a mould; on one side it is to be supported by a fixed block, part of the anvil itself, shaped reversely so as to fit the shape of the rail; on the other side it is to be supported and held in place by a movable block with a face adjusted to the shape of the rail on that side, the movable block being capable of advance toward the fixed block, and of retrogation after the rail is placed on the anvil; the rail is also, when in place, to be supported under its base by the anvil. It thus has a bottom support and two side supports.

The court, having thus construed the patent, then proceeds to examine the devices which the railroad companies claimed anticipated Cawood's invention. These devices were the angle-iron machine, the bayonet machine, and the Church machine.

The angle-iron machine does not contain the principle of the invention described in Cawood's patent. There are points of resemblance between these machines, but there are also very substantial differences. While the purpose of the Cawood machine is to aid in mending rails already made, the angle-iron machine is to assist in welding together, at right angles with each other, two iron bars, making a fillet in the interior angle to strengthen the rail when made. To effect this, the fixed block on the anvil has necessarily a peculiar construction, unlike that in the Cawood machine. It is beveled or rounded off at the top of the face opposite the movable block, so as to give room for the formation of the fillet. And not only is the face of the fixed block unlike that of the fixed block in the Cawood machine, but its function is entirely different. It is to furnish support for one of the two bars designed for the formation of the angle iron. One entire limb of the angle iron is laid upon the top of the block, unconfined laterally, and there exposed to the hammer, the block being the anvil. The iron is thus left free to spread out in both directions, instead of being prevented from spreading laterally by the press block, as in the Cawood machine. Again, in the angle-iron machine, no provision is made for a bottom support for the rail.

The bayonet machine used at the Springfield Armory before and since 1850, for forging parts of bayonets, is, in form and substance, nothing but a hinge vise with a peculiar shape of the jaws, intended to facilitate operations upon the shank and socket of a bayonet, while the Cawood machine is an improved anvil, not a vise.

The Church machine, patented in England in 1846, while employed for strengthening and flattening the rails for railways, is totally incapable of performing the work of the Cawood machine. It is not an anvil. There is no fixed block cast as part of an anvil. There is a stationary die, part of a frame, against which one side of the rail is placed to resist the lateral pressure exerted upon it by a sliding lateral die on the other side of the rail, and above is a horizontal bar, which is forced downwards by a series of jointed levers, carrying another die upon the upper surface of the rail. There was nothing, therefore, in any of the three patents above named which anticipated the Cawood invention.

The court further holds that Cawood's claim for moving the blocks by cams, or "in any other convenient manner," entitles him to move the blocks by any means adapted to the work the machine was intended to perform.

The court, in conclusion, decrees that "The Illinois Central," "The Etheridge," "The Whitcomb or Cleveland Block," machines are infringements of the Cawood patent; but that the "Michigan Southern," "The Bayonet vise," "The Beebee & Smith" machines are not such infringements.

The infringement suit of Herring *vs.* Nelson has just been decided. This suit was brought on the re-issued letters patent granted to John Deuchfield for an improvement in cooling and drying meal. The main questions in the case, and those on which it turned, were whether or not the re-issued letters patent were for the same invention as the original patent, and whether or not new matter had been introduced into the specification, contrary to the provisions of section 53 of the patent act of 1870. The original claim consisted only in a combination of parts or elements. No device was claimed, as the invention of the patentee, which entered into the combination. Under the patent, as originally issued, it was therefore quite plain that no infringement could be made out without showing a use by the defendant of the complete combination with all its elements, for that was the thing patented. The combination, of course, disappeared when any element of it was omitted, In the re-issued letters patent, however, a new claim was added, for a combination of parts or elements, each of which made part of the original claim. Under this claim the operation of the re-issued letters patent was greatly enlarged beyond that of the original letters patent. It entitled the patentee to exclude everybody from using the combined elements of such new claim, while the original letters patent would be effectual only to exclude the use by others of the elements of the new claim when combined with the other elements of the original claim. It therefore enabled the patentee to make out an infringement by showing a use of the combination specified in the new claim, which omitted a number of the elements combined in the original claim. This question, namely, whether or not the reissued letters patent were for the same invention as the original patent, the court decides in favor of the complainant. It holds that a sub-combination of elements which coact in the production of a perfected joint result can be rightfully claimed in conjunction, since they constitute a true combination in the sense of the law, and not a case of juxtaposition.

In regard to the second question in the case, namely, whether or not new matter had been introduced into the specification, the evidence showed that the drawing attached to the re-issued letters patent were the same as were annexed to the original. The mechanical structure, so far as the machine came under the new claim in the re-issue, was exactly the same as was described in the original specification up to that point. Nor was anything added to the description of the further mechanical structure of the machine as originally described. Looking at the mode of operation of the machine, as set forth in the original specification, the re-issued letters patent made no alteration in it, so far as the machine came under the new claim in the re-issue. The mechanical arrangements were all unchanged, the mode of operation of the several parts was correctly described, and the results of the action of the whole was correctly stated. But it was obvious that while the combined action of all the parts produced the complete result, yet that the mere cooling and drying of the meal was the result of that part of the machinery which was covered by the new claim in the re-issued letters patent. The court sustains the re-issued letters patent on this second question, and holds that the doctrine of Vance *vs.* Campbell (1 Black, 429), namely, that the use of a lesser number of elements than are contained in the patented combination is no infringement because not the same invention, does not apply to the practice of reissuing patents; and that while it is true that the law requires that re-issues shall be for the same invention as the originals on which they are based, yet it is no departure from this law to make separate claims to sub-combinations which were originally joined in one.

New Agricultural Inventions.

George W. Gordon, of Beverly, O., has patented a novel mode of Unfastening the Latch of a Gate from either side, without dismounting from a horse's back. It consists in the employment of a lever, middle-pivoted on a standard that is itself supported on the top rail of gate and connected with the latch or latches. If a horseman approaches from one side he raises, and if from the other he depresses, the lever. He then pushes with the lever until the gate is open, and closes it by reversing the direction of his push.

Willis Armstrong, James G. Smith, and John F. Armstrong, Owensville, Ind., have patented a Stump Burner, which consists of a conical sheet iron hood provided with a chimney, fuel door, draft holes, and handles. To use the burner it is placed over the stump to be burned and fuel is placed on or around the latter. The fuel is then ignited, the fuel door closed, and the draft slide opened. The fire will soon become intense, and being concentrated around the stump and the flame tending upward, and the radiation of heat being for the most part prevented, the stump will be rapidly consumed.

George H. Smith, of Freeport, Ill., has patented a Gate, which is an improvement in the class of farm gates which are supported by pivoted bars and move in a vertical frame when opening and closing, thus describing the arc of a circle, but at the same time preserving a horizontal position. The improvement relates to the construction and arrangement of the bars that support the gate, and the connection of latch or locking devices therewith in such manner that the gate is prevented sagging or swaying, operates more easily than others of its class, and is locked shut at both ends simultaneously.

Astronomical Notes.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, December 29, 1877.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

Mercury sets	6 6	evening
Venus "	8 24	"
Mars in meridian	6 06	"
" sets	0 21	morning
Jupiter "	5 01	evening
Saturn in meridian	4 35	"
" sets	10 08	"
Uranus rises	8 47	"
Neptune in meridian	7 38	"
" sets	1 15	morning

FIRST MAGNITUDE STARS.

Sirius rises	7 04	evening
Procyon "	8 39	"
Betelgeuse "	4 48	"
Regulus "	8 43	"
Spica "	1 24	morning
Aldebaran in meridian	9 54	evening
Vega sets	8 53	"
Altair "	7 40	"
Fomalhaut sets	8 18	"
Capella in meridian	11 32	"
7 stars (cluster) "	9 05	"
Vernal equinox "	5 26	"

REMARKS.

The earth is nearest the sun December 31, being 3,070,538 miles nearer than it was July 3. The sun is slowly moving northward, and the days are as slowly increasing in length and the duration of twilight lessening. The sun rises and sets 31° 18m. 20s. south of the east and west points of the horizon.

Mercury sets 1h. 26m. after the Sun, at a point in the horizon 2° north of the sunset point. It is in *Sagittarius*, and there are no conspicuous stars in the vicinity which could be mistaken for the planet. Venus is the most conspicuous object in the evening sky; she is in *Capricornus*. Mars is directly south in early evening, in the constellation *Pisces*. His position is not marked by any bright stars. Jupiter sets 1h. 21m. after the sun. He is in *Sagittarius*, 7° northeast of the "Milkmaid's Dipper." Saturn is southeast of Mars, in *Cetus*, almost directly south 10° of the second magnitude star Menkar. Uranus rises 4m. after the brilliant star Regulus in the handle of the Sickle in *Leo*.

NEW BOOKS AND PUBLICATIONS.

THE ART OF HOUSE PAINTING. By John Stevens. John Wiley & Sons. Publishers, New York. Price 75.

This is a clear and comprehensive record of the observations and experiences, during many years, of a practical worker in the art. It is full of valuable suggestions and is designed to instruct and assist in the everyday work of painters and others. Its directions and cautions for outside and inside work are very minute and particular. All who build houses, as well as those who live in them, will find many hints which they can use to their advantage.

A GUIDE TO THE DETERMINATION OF ROCKS. By Edward Jannettaz. Translated from the French by Geo. W. Plympton. C.E. D. Van Nostrand, Publisher, New York. Illustrated.

This well known and standard work of the French author has been translated with a view to supplying students with a desirable supplement to the ordinary course of geology, at the same time affording an easy introduction to the larger treatises on lithology. Its thoroughly practical character, together with the simplicity of the methods of examination, will claim the favorable notice of teachers and learners of the department of science. It embraces a description of the more important minerals from the lithological point of view; the method to be followed in practically determining rocks and a dichotomic table for determining rock species.

LETTERS TO WOMEN ON MIDWIFERY, ETC. By Joel Shew, M.D. S. R. Wells & Co., publishers. New York. Price $1.50.

This is one of Dr. Shew's best and most useful books, which has been for some time out of print. The book is particularly designed for the use of women, and it aims mainly to prevent mistakes and diseases by pointing out the proper course to be pursued in given contingencies.

Inventions Patented in England by Americans.

From October 9 to November 20, inclusive.

AERIAL BATTERY.—A. W. Gittens, New York city.
BALE TIES.—S J. Chapman *et al.*, Charleston, S. C.
BOTTLE STOPPER.—W. Hicks, Brooklyn, N. Y.
BOBBINS.—M. J. Nealon *et al.*, Chester, Pa.
BRICK MACHINE.—H. C. Sargeant *et al.*, New York city.
BRUSHES, MANUFACTURING.—I. H. Hyatt, Newark, N. J.
BUTTON HOLE LINING.—D. Harris, Brooklyn, N. Y.
CARBURETTER.—D. E. Bangs *et al.*, Boston, Mass.
CHURN.—J. L. Sprague, Hermon, N. Y.
COAT.—J. Paret, New York city.
CONDENSER.—W. E. Sudlow, New York city.
COTTON PRESS.—S. H. Gilman, New Orleans, La.
COTTON REEL.—W. Grover, Holyoke, Mass.
ELECTRO-MAGNETIC HYDRAULIC ENGINE.—K.C. Atwood, New York city.
EMBOSSING MACHINE.—C. L. Nagel, Brooklyn, N. Y.
EYELET.—J. Whitehead *et al.*, Cranston, Pa.
FEED ROLLER REGULATOR.—C. H. Chapman, Mass.
FOOD FOR ANIMALS.—J. S. Kirk *et al.*, New York city.
GAS REGULATOR, ETC.—M. W. Kidder, Boston, Mass.
HARVESTING MACHINE.—W. F. Goodwin, Stetton, N. J.
HORSESHOE.—J. S. Williams, Riverton, N. J.
HORSESHOSE, MAKING.—J. D. Billings, New York city.
HYDRAULIC MACHINE.—S. Marsden, St. Louis, Mo.
INHALER.—L. E. Fulton *et al.*, Potsdam, N. Y.
IRONING MACHINE.—T. S. Wiles, Albany, N. Y.
KEY RING.—J. S. Birch New York city.
KILN.—Professor H. Wright, Philadelphia, Pa.
LEATHER-CRIMPING MACHINE.—S. W. Jamison, Brooklyn, N. Y.
METAL TAPPING DEVICE.—W. Doward, Rochester, N. Y.
METAL EYELETS.—J. Whitehead *et al.*, Cranston, Pa.
MECHANICAL MOVEMENT.—W. F. Goodwin, Stetton, N J.

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The Charge for Insertion under this head is One Dollar a line for each insertion.

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For the best Gate Valves of all kinds, apply to D. Kennedy & Co., 88 John St., N. Y.

Boulter's Superior Muffles, Assayers and Cupellers Portable Furnaces, Slides, Tile, Fire Brick and Fire Clay for sale. 1,609 North St., Philadelphia, Pa.

"Little All Right," the smallest and most perfect Revolver in the world. Radically new both in principle and operation. Send for circular. All Right Firearms Co., Lawrence, Mass., U.S.A.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Felt of every description for Manufacturers' purposes, especially adapted for Polishing, can be furnished in any thickness, size, or shape. Tingue, House & Co., Manufacturers. Salesroom, 69 Duane St., N. Y. Factory at Glenville, Conn.

Best Pulleys and Couplings made; secured to shafts without keys, set-screws, bolts, or pins. Send for catalogue. Taper Sleeve Pulley Works, Erie, Pa.

Hand Fire Engines, Lift and Force Pumps for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N.Y., U.S.A.

Lansdell & Leng's Lever and Cam Gate Valves. Cheapest and best. Leng & Ogden, 212 Pearl St., N. Y.

The Varnishes and Japans of Hyatt & Co., established 1872 ("The London Manuf. Co."), made from scientific formula by a practical maker of materials, free of deleterious substances, are, in the success met with, noted for color, purity, and durability, with cheapness, giving them meritorious pre-eminence. Try them. Send for circulars and price list to Company's office, 246 Grand street, N. Y.

Silver Solder and small Tubing, John Holland, Cincinnati, Manufacturer of Gold Pens and Pencil Cases.

Mill Stone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 64 Nassau St., N. Y.

Chester Steel Castings Co. make castings for heavy gearing, and Hydraulic Cylinders where great strength is required. See their advertisement, page 414.

Patent Scroll and Band Saws. Best and cheapest in use. Cordesman, Egan & Co., Cincinnati, O.

For Boult's Paneling, Moulding, and Dovetailing Machine, and other wood-working machinery, address B.C. Machinery Co., Battle Creek, Mich.

Reliable information given on all subjects relating to Mechanics, Hydraulics, Pneumatics, Steam Engines, and Boilers, by A. F. Nagle, M.E., Providence, R. I.

For Sale.—40 in. Lathe, $225; 30 in. do., $200; 18 in. do. $195; 18 in. do., $185; 7 ft. Planer, $350; at Shearman's, 132 N. 3d St., Philadelphia, Pa.

Planers, Engines, and Hand Lathes, Screw and Milling Machines, Presses, Spindle Drills, etc., for sale. For particulars, address P. O. Box 744, New Haven, Conn.

The best Cornice Brake. J. M. Robinson & Co., Cincinnati, Ohio.

Wanted.—A Spring Castor; rubber or spiral. C. F. Hill, Hazelton, Pa. Inventor of Folding Bookcase.

Notes & Queries

(1) G. W. inquires (1) whether 100 small cogwheels be run altogether by one belt, in a circle, the object being to bore 100 holes through 1½ inch wood, ¼ inch in diameter? A. Yes. 2. How many revolutions will the cogs have to make, and what would the size of belt be? A. The cogs should make at least 500 revolutions per minute, and a 2 inch belt will answer.

(2) J. W. W. writes: 1. Is there not a substance that can be cut deeply with acids which may be photographed upon as in the "Albertype process," and a stereotype taken from it in type metal so as to be printed among types on a printing press, and what substance is it? A. We believe there is nothing better for this purpose than the bichromated gelatin film; the print being produced by inking the surface, that is left in relief, by washing the film with water after it has been placed under a negative and exposed to light. 2. Is there any combination of liquids that will cut glass and have no effect on oils? A. Water, which has absorbed hydrofluoric acid gas, will etch glass; and will have very little effect on oil. This solution must be kept in bottles made of rubber (caoutchouc). For very fine etchings it is best to expose glass to the gas itself, produced by pouring sulphuric acid on fluoride of calcium (fluorspar).

(3) C. H. H. asks for the diameter and pitch of a screw wheel that will be the proper size for two cylinders 8" x 12" with 100 lbs. pressure per square inch and connected directly to main shaft? A. Diameter 4½ feet, pitch 6 feet.

(4) W. B. asks: What is hydramyle, its uses, properties, and effects? A. Amyl hydrate or amylic alcohol (the principle of fusel oil) is a constant accompaniment of alcohol (ethyl alcohol) prepared from corn, potatoes, the must of grapes, etc. It passes over in considerable quantities towards the end of the distillation, and may be collected apart. To obtain it in a state of purity these portions are freely washed with water, the residue redistilled, and the portions passing over between 267°—270° Fah. collected separately. It is a colorless liquid having an odor peculiar to itself and a burning taste. Its chief use is in the production of several fragrant ethers, as amyl acetate, which has the odor and flavor of the Jargonelle pear. These are used largely for flavoring confectionery and liquors, and by perfumers. To the presence of amylic alcohol in cheap liquors is attributed their potent intoxicating properties.

(5) A. H. A. asks: How large a cylinder will be required with length of stroke, at 40 or 50 lbs. pressure, to propel a boat 23 feet long, 5 feet beam, and 15 inches deep, at a rate of 12 miles an hour? A. We think you will have difficulty in designing proper machinery for such a speed at the pressure of steam mentioned.

(6) W. H. writes: We have a 5 inch steam pipe running from the surface down inside a mine. I have noticed sometimes, in caulking a thimble that was leaking, something like an electric spark flit across the point of chisel. A. Electric phenomena are sometimes noticed in the case of steam escaping from small orifices, and are attributed to the friction at the point of escape.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

H. K.—It is acetate of copper.—R. M. D.—It is sulphide of iron.—W. H. D.—The sample consists principally of ferric sulphide. It may or may not contain traces of precious metals. The sample was too small to admit of examination.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Gas Poisoning. By N. D.
On a Preventive of Colliery Explosions. By G. W. D
On Predicting the Weather. By G. R. C.
On Hydraulic Rams. By E. B., M.D.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

WANTS AND BUSINESS INQUIRIES.

Almost any desired information, and that of a business nature especially, can be expeditiously obtained by advertising in the column of "Business and Personal," which is set apart for that purpose subject to the charge mentioned at its head.

We have received this week the following inquiries, particulars, etc., regarding which can probably be elicited from the writers by the insertion of a small advertisement in the column specified, by parties able to supply the wants:

Where can I obtain a portable mill for grinding wheat?

Where can chrome steel be obtained?

Who sells simple horse powers?

OFFICIAL.

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November 13, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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10,311.—FONT OF ORNAMENTAL PRINTING TYPES.—J. Herriet, New York, N. Y.

10,312.—WHITE LINED PIPKINS.—J. E. Jeffords, Philadelphia, Pa.

10,313.—BASKET TEA POTS.—J. E. Jeffords, Philadelphia, Pa.

10,314.—WOVEN BORDERS FOR TOWELS.—R. T. Webb, Randallstown, Ireland.

[A copy of any of the above patents may be had by remitting one dollar to MUNN & Co., 37 Park Row, New York city.]

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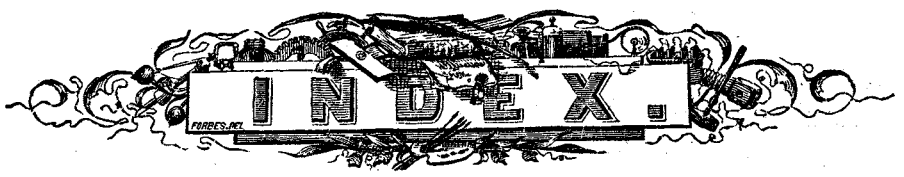

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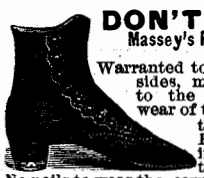

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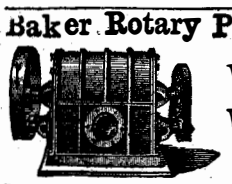

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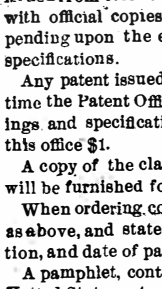

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